

ANNALS OF THE
ROYAL COLLEGE
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OF ENGLAND

VOLUME 29

DECEMBER 1961

No. 6



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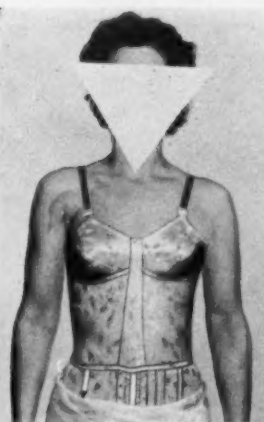
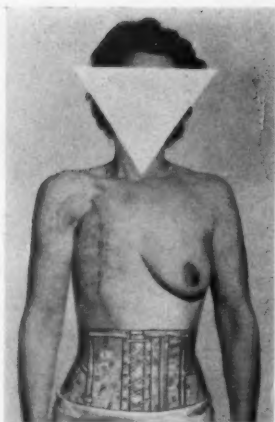
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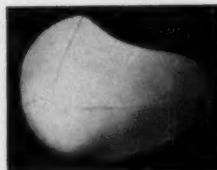
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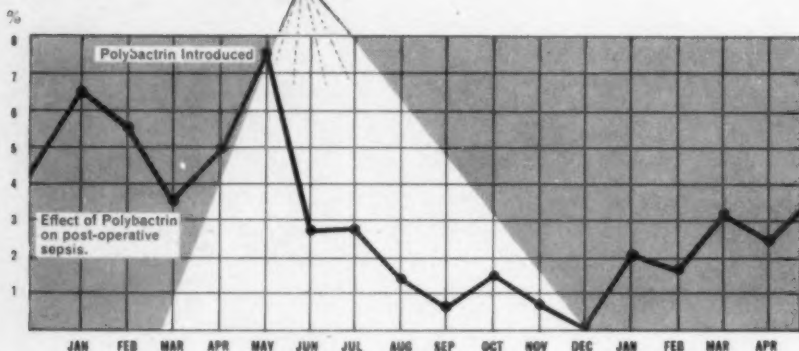
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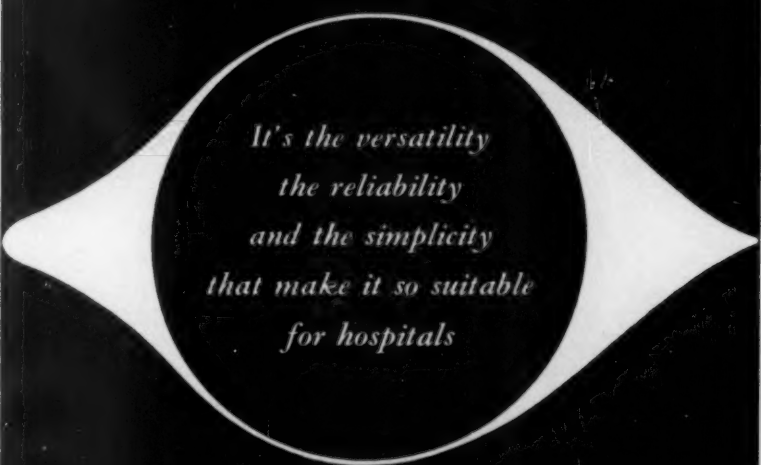
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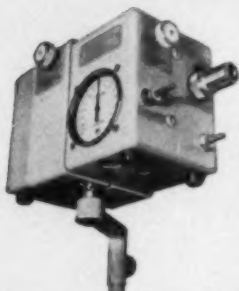
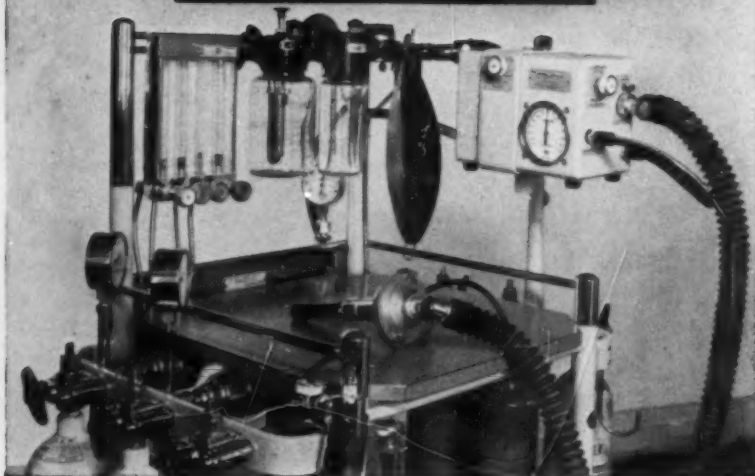
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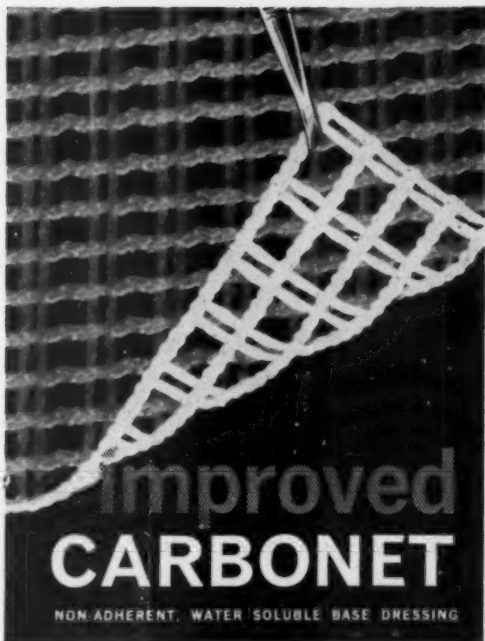
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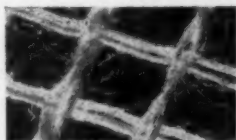


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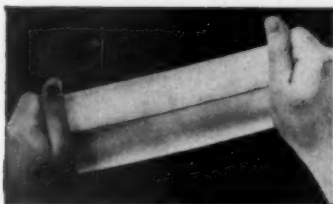
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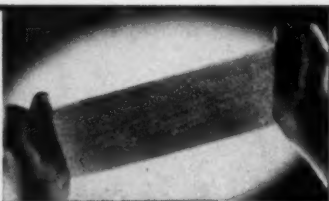
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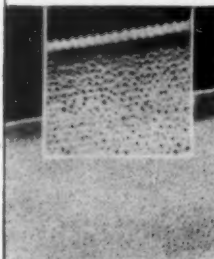
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Annot., Lancet, i, 375, 1960.

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The Syme Oration delivered at the opening ceremony of the meeting of the
Royal Australasian College of Surgeons at Brisbane

on

23rd May 1961

by

Hedley Atkins, D.M., M.Ch., F.R.C.S., F.R.A.C.S. (Hon.), F.A.C.S. (Hon.)

Professor of Surgery, Guy's Hospital; Dean of the Institute of Basic Medical Sciences,
Royal College of Surgeons of England

MR. PRESIDENT, MR. VICE-CHANCELLOR, YOUR HONOUR, MR. CHANCELLOR, MEMBERS OF COUNCIL, LADIES AND GENTLEMEN. I am all too conscious of the fact that to have been asked to deliver the Syme Oration before such a distinguished audience is one of the greatest honours that has happened to me. In fact, I have never been asked to give an oration before—speeches yes, at weddings, at convivial gatherings, speeches of welcome and speeches of valediction, even from time to time an address, but never an oration; and I wondered in what special way an oration should differ from an address. I suppose the majority of orations commemorate great men as Mark Anthony's funeral oration on Julius Caesar or the annual Hunterian Oration at the Royal College of Surgeons of England. This oration commemorates George Adlington Syme, the first President of the Royal Australasian College of Surgeons, a body which he did so much to create. Sir George was born in Nottingham in England of a Quaker mother and a Scottish father. His honours and distinctions will be known to many of you; his appointments and his service to hospitals and University in the city of Melbourne are enshrined in the records. He was President of the Medical Congress Federal Committee, Chairman of the Federal Health Commission and a leader in many other public offices. In 1923 he was President of the Australasian Medical Congress of the British Medical Association and in all these high offices he gave unstintingly without thought for himself. In reading about this leader of Australian medicine, however, one can discern shining through the cold recital of his accomplishments the figure of a kindly, shrewd and indefatigable Christian gentleman. In his family and in his friendships he found an abiding joy and it is to the memory of this great man that this humble dissertation is dedicated.

Looking at the titles of previous orations it is clear, however, that the Syme orators have not felt it necessary to dwell on the life and personality of one who is so well known, but they have ranged widely over a diversity of subjects. Indeed the invitation to deliver this oration contains no indication as to subject, the orator is left with a free choice, and in this life I have found that a free choice is one of the most difficult privileges to exercise. After all, everyone is reasonably free to marry whomsoever he or she chooses, and yet marriages thus determined are by no means necessarily happier than those arranged, as for instance in France, without

reference to the participants. Nevertheless, free choice I had and so I determined to talk about the most cherished of my possessions—my small library.

When I go into my library I am surrounded by approximately twelve hundred friends, friends whom, for the most part, I know intimately because every book in my library, except for reference books and dictionaries, which are by no means to be despised, was bought singly and individually, was read because I wanted to read it, and was kept because I should want to read it again. I am not of course referring to my surgical library, which contains perhaps another thousand volumes, but these I regard as colleagues rather than friends, thrown into my company because of common interest and not chosen with loving care for life's companionship.

If in an oration it is permissible to descend to the vernacular, I should describe myself as a "buffer" for books. My medical studies inform me that there are those who are unable to pass a "pub" without going in and spending all the money they have on the wares therein dispensed. While by no means averse myself from calling on such hostelries, I have not this compelling desire to visit them and there are some which I prefer not to enter. With bookshops, however, I am like this. I scarcely ever pass a bookshop without going in, and I can never go in without buying, and having bought I am never content until I have read what I have bought. New books are living things, the pages very slightly adhere, the dust-covers are inviting, they smell delicious and I love them. Henry Labouchère says, "I can read anything which I call a book. There are things in that shape which I cannot allow for such. In this catalogue of books which are not books—*biblia-a-biblia*—I reckon Court Calendars, Directories, the works of Hume, Gibbon, Robertson, Beattie, Soame Jenyns and, generally, all those volumes which 'no gentleman's library should be without'."

Now here I think Labouchère is sadly misled. I must confess I have never heard of Robertson, Beattie or Soame Jenyns (except as a friend of Charles Darwin), but for Hume I have the greatest admiration and for Gibbon a positive affection.

I remember as a young undergraduate at Oxford sitting over the fireside with my tutor, C. N. Hinshelwood, now so distinguished a past President of the Royal Society that it might be deemed boastful that I should refer to such an incident, and the talk turned to literature. We played a game in which we quoted to each other the most arresting piece of prose and the most enchanting piece of poetry that we could think of. I remember that he quoted that passage from Gibbon where he describes the Emperor Gordianus the Younger. "Twenty-two acknowledged concubines and a library of 62,000 volumes," says Gibbon, "attested the variety of his inclinations, and, from the productions which he left behind him, it appears that the former as well as the latter were designed for use rather than for ostentation."

A SMALL LIBRARY

The *Decline and Fall* no book?—*Biblium a biblium?*—Shame on you Labouchère!

The most enchanting piece of poetry? I remember his choice which first made me realize that Shakespeare was immortal, that "Shakespeare" was not just a subject in the School Certificate or "prep", but something (although too human to be divine) yet of ageless beauty. The passage was from the balcony scene in *Romeo and Juliet*—towards the end as Romeo speaks:—

"It was the lark, the herald of the morn
—No nightingale.
Look love what envious streaks
Do lace the severing clouds in yonder East:
Night's candles are burnt out, and jocund day
Stands tiptoe on the misty mountain tops,
I must be gone and live—or stay and die."

Come then with me into my small library. The books are arranged according to subject and we must make our choice for there is not time for me to introduce you to more than a very few, although I should like to do so. Would you wish to meet my "Arty" friends? These are mostly illustrated catalogues of exhibitions, volumes of complete works of artists mostly in colour, a few learned discourses on the "meaning of art", the history of art and so on. Perhaps on the other hand, it would be better if I picked out one or two from each group and introduced them rather as an *aide-de-camp* picks out the most presentable or popular specimen from the ranks to present to the inspecting royalty.

I am afraid that the one I would select from this section would be the scrap-book that I have made myself. I started this in 1925 and in it are pasted all the pictures that I have enjoyed—if possible in colour reproduction—with everything that has been written about them in newspapers and journals, together with their place of residence; so that when I go to a city in Europe or America and visit its art gallery I am almost certain to be greeted by an old friend. One rather unusual volume I should mention—*The Works of Christopher Wood*. These are all gay paintings of Brittany and are of boats and the sea and sailors dancing which you may have seen reproduced as Christmas cards. Wood died in his late twenties, having fallen off the platform at Reading station in front of a train. What a gallery of delight he would have given us if the fates had been more kindly disposed to this sensitive, saddened genius!

This reminds me, although I like making scrap-books and jotting down notes, I resolutely refuse to deface books in the margin, so-called embellishments, and horror of horrors—dog-eared the pages to mark favourite passages. In this—as in many other things—I am very different from Max Beerbohm. Sir Max would embellish his books with little drawings in the margin, even on one occasion writing on the flysheet a burlesque presentation inscription in his own imitation of Queen Victoria's handwriting. In another of his books he adorned a photograph of Bernard

Shaw with a bowler hat alleged to have been worn by Karl Marx in his bourgeois days.

The nicest scrap-book I possess is that made by my wife and myself when we walked from Winchester to Canterbury along the prehistoric way originally traced by Hilaire Belloc and now known as The Pilgrims' Way, because that was the route which the pilgrims took from our West Country to the shrine of Thomas à Becket. Had I acquired Max Beerbohm's habit, the margins of this book would be embellished with a motif from cornplasters and iodine!

But I digress. Next to pictorial art is music. Knowing nothing about music, but, as Sir Thomas Beecham remarked of all Englishmen, "Simply loving the noise it makes," this is rather a small section. *The Oxford Companion to Music* enables me to contradict the wilder asseverations made by my children, and Hadow informs me what a symphony is. One of the most remarkable books, however, is Stravinsky's *Poetics of Music*, a series of ten lectures delivered when he was Norton Professor at Harvard. These are delightfully written; they lambast Wagner as you would expect, and they display a talent for prose composition which would have guaranteed for Stravinsky a niche in the Hall of Fame as a writer had he never put crotchet to paper.

Then we come to the standard authors—the books that "no gentlemen's library should be without"—Jane Austen, Dickens, Trollope, Richardson, Thackeray, Defoe, Tolstoy and Dostoevsky. These I turn to in times of stress. They are mostly in pocket editions and can be taken in aeroplanes and trains, read comfortably whilst lying on one's back in bed, and, apart from mathematics, constitute my one flight from reality. But you know these already and we must press on.

There comes next a section devoted to tales and *belles lettres* published since the first world war. Books perhaps that I have borrowed from the library; read—and returned (!)—but wished to keep. Some have been sent to me by friends—two for instance from Sir Stanford Cade: *The Old Man and the Sea* by Hemingway and *Dr. Zhivago* by Boris Pasternak, long before I or anybody else that I know had heard of them, and before they became universally read and admired. He sent them to me just because he liked them and he thought I would too. We have in fact this rather agreeable habit in regard to each other, and I remember I sent him *Parkinson's Law* on the week of its publication.

In this section I have two signed copies of limited editions. One *Cakes and Ale* by Somerset Maugham and *Capri* by Norman Douglas. I suppose that these two books are valuable or will become so, and some of the other books in my library may be valuable, but I would not know for I am not a bibliophile. I like books for what they say to me not as *objets d'art* or articles of furniture. I have a brother-in-law (as I have several he need not be identified) who has a cocktail cabinet fronted with the backs of

A SMALL LIBRARY

classics in calf so that it looks like an extension of his library. When you lift up the backs of the complete works of Henry James a light goes on and there are discovered, as the playwright would say, bottles of whisky, gin, brandy and all those things, which no doubt Labouchère would describe as articles which "no gentleman's library should be without". I am in no sense shocked at this arrangement, which strikes me as being at the same time tasteful and practical. It is certainly no worse than going to a country house sale and buying a complete library of books, that will never be read, for the sake of the weight of the calf, and the wonderful gilding. On the other hand, I am a little bit mistrustful of paper-backs only because nearly all the paper-backs I buy are books that I should like to keep and they do tend to fall to bits. If some enterprising bookbinder would undertake to put paper-backs into hard covers, I should try to be his first and would certainly be one of his most faithful customers.

Talking of Henry James reminds me that there has recently been produced a new edition of his short stories which reposes in this part of my library. By many he is regarded as a superb stylist, but I find him disappointing. These men smack (if that is the correct expression), they all smack the tiniest bit of the midnight oil. Take Stevenson: they made me read him at school because his style was so perfect, and what did they make me read?—not a rattling good yarn like *Treasure Island* or *Kidnapped*, where you need not bother to notice the superb style, but *Travels with a Donkey* and *The Silverado Squatters*. I can just about remember what beautiful style these books were written in—at least so I was told, but I cannot for the life of me remember anything else about them, except, so far as I can recall, that the donkey's name was "Modestine". So it is with Henry James. There is the evocation of a tremendously dramatic atmosphere, such as would be appropriate to de Quincey's *Murder as a Fine Art*, the nerves are tensed and the senses quickened to expect at least the revelation of some appalling secret, when he simply pulls out the plug and it all gurgles away down the drainpipe.

They say that a really long painless illness is the thing for getting through books that you always meant to read and for which you have never had time. That is as may be, but I know one experience which is even better and that is a "phoney war". From September, 1939, to September, 1940, I stood gallantly at my post, ready, even willing, to attend to the thousands of air-raid casualties which were expected almost hourly. During that time I was able to write a book and read *War and Peace* together with seven out of the eight volumes of *The Decline and Fall*.

Whether I should ever really have finished *The Seven Pillars of Wisdom* or been able to find the relevant passages in *Ulysses*, no one will ever know because while engaged in that task, "our beloved Führer" decided to clear eleven acres of building site adjacent to my hospital by means of a few

high explosives and numberless incendiaries, a site on which our beautiful new hospital has now been erected. There were no casualties in this thorough process of demolition so that the new block was built at no cost in blood or tears, although my suggestion to The Governors that we should in mock gratitude call one ward the "Adolf Hitler Ward" was not, it seems, taken seriously. However, this incident (as we used to call it in those days) was the prelude to many more grim occasions in which our services were called for and the phoney war was at an end.

Now we are wasting time and must move on, nodding at the sections on History, Travel, Sailing and Biography except to say that *The Reason Why* by Cecil Woodham Smith is the only book that I have begun at 9 o'clock one evening and finished at 3.30 the following morning without even laying it down. At least I think those were the relevant times but I will not guarantee them in case some impertinent busybody should find out the number of pages, divide by the number of minutes in the above-mentioned interval, take the square-root for all I care, and triumphantly declare that I could not have done it in the time without skipping; or alternatively that I must be a very dilatory reader or I must have fallen asleep in the middle—or all these. I hate that sort of individual.

There are too, of course, sections on Architecture and some technical works on Navigation which are, in a sense, both colleagues and friends; but I will not introduce them to you on this visit although the latter at least conjure up memories of happy days spent aboard the various small boats which the family has possessed from time to time. I used to think that navigation was my strong point until one day I laid off the correction for tidal drift in the wrong direction and found myself at 2 a.m. on a rainy, squally night hopelessly lost in the middle of the North Sea instead of sailing peaceably up the Thames towards the lights of London. Perhaps, however, I should mention the log books. I have never put to sea without keeping a log, but a professional sailor—even a really keen yachtsman—would regard these logs somewhat askance. They do indeed contain records of distance run, course, vagaries of wind and weather and so on as every proper log should, but they are mainly filled with more homely accounts, as for instance of the night when my wife stored the onions under the pillow on my bunk, or the heroic exhibitions of seamanship which were entailed in getting our dog ashore to find something that would do for a lamp-post before setting out on a night's cruise. I may say in passing, and for the benefit of those who might be similarly placed, that all our dogs have had a respect for our begrimed and muddy planks which would satisfy an admiral pacing his immaculate quarter-deck. This instinct, admirable though it is in a way, puts the skipper to considerable inconvenience and occasionally leads to extravagant alterations of course in order to close the land at appropriate intervals.

A SMALL LIBRARY

Let us move on to Poetry. Here the essential Philistinism of this whole collection of books is betrayed. I shall get my confession out of the way at once by saying that I love both John Betjeman and Ogden Nash. The fact that my favourite anthology is *Other Men's Flowers*, culled by Lord Wavell, reassures me, however, that there are those who can yet make their mark in this world who share my plebeian taste in these matters. Even worse—I had occasion to shelter in the library of the University of the West Indies some little while back, while the rain poured down in vertical torrents in such a way as I had never seen before. Beside my chair was *The Complete Poetical Works of Rudyard Kipling*, no doubt removed from its shelf by some primitive Islander. I picked it up and, do you know? I thought some of it simply splendid. I am sure that both Gertrude Stein and Edith Sitwell will be delighted to know that I regard their works as either incomprehensible or silly. I have tried Dylan Thomas, but he is not for me, so that Gertrude and Edith and Dylan find no shelter beneath my roof. Much of the works of the lyric poets I regard as entrancing, but I find it hard to believe that *The Rhyme of the Ancient Mariner* is really a great work and filled with a deep inner meaning.

There is incidentally a small section—a subsection you might call it—given over to French and German poetry. I can speak these languages only very haltingly, but before visiting countries where they are spoken I find that to learn by heart something by Alfred de Musset or Goethe prepares the mind for the transition to foreign climes and gets you back into the swing of it—perhaps “the swing of it” is in my case rather too strong a term: let us say the tremor of it.

So far the sections in my library have been arranged without much purpose or order, any section might have been changed with any other section without much consequence, but now out of the corner of my eye I can see that we are approaching that part—by far the largest part—which, to my mind at any rate, leads on sequentially. We are coming on to the section devoted to Mathematics, Science, Philosophy and Religion.

I must apologize for bringing in Mathematics, because I know that to a large number of people Mathematics is altogether abhorrent. To me, however, there is something clean, definite and logical about Mathematics that has a tremendous appeal. Sometimes I think that numbers are the only real things in an increasingly insubstantial universe. It is an interesting reflection that there are no women mathematicians of any stature. I wonder why this is. Perhaps the sweeping generalization that women are illogical creatures has some truth in it. But this cannot be the whole answer because some world-famous mathematicians can be quite illogical. The great Professor Hilbert, who succeeded Gauss in the Chair of Mathematics at the University of Göttingen was once staying with Professor Max Born, the famous physicist. During dinner it came on to pour with

rain to such an extent that Frau Born told Professor Hilbert that he would have to stay the night as he could not possibly go home in that downpour. In a little while they all retired upstairs, but after about an hour Professor Born was woken up by a furious ringing of the front-door bell. He went downstairs and opened the door to find Professor Hilbert standing in the pouring rain on the doorstep. "My dear fellow," he said, "what on earth are you doing?" "Oh," said Professor Hilbert, "I just went home to get my pyjamas!"

Talking of Göttingen reminds me that the University has offered a prize of 100,000 marks for the first person to solve what is generally known as "Fermat's Last Theorem". You will remember that the squares on the adjacent sides of a right-angled triangle add up to the square on the hypotenuse, a relation which can be expressed by the equation $a^2 + b^2 = c^2$. This equation can be satisfied by an infinite number of integers or whole numbers; for instance 3, 4 and 5; or 5, 12 and 13 can be substituted for a , b and c respectively. The extraordinary thing is that nobody has ever found an integral solution for $a^3 + b^3 = c^3$ or $a^4 + b^4 = c^4$ or indeed any equation of the type $a^n + b^n = c^n$ where n equals any number greater than two. Fermat said that he had proved that no solution to these equations existed. He had found a proof of this but as he always jotted down his proofs in the margin of his Diophantus and, as the margin was not wide enough to accommodate this particular proof, he had not set it down. From that day three centuries ago until to-day professional mathematicians, amateurs, cranks and crooks have tried to solve this problem and win the 100,000 marks offered by the University of Göttingen. Many mathematicians have submitted "proofs" only to find that on careful scrutiny there was some flaw. About two years ago *The Times* announced that a young Pakistani mathematician who rejoiced in the name of Yah Yah had devised a proof which had stood up to all tests and he was claiming the prize, but I have not been able to discover whether he succeeded.

Before we leave Mathematics, to your intense relief no doubt, I should like to state that advanced School Mathematics, such as the proof of the binomial theorem or the solution of a differential equation, is often far more difficult than the early stages of so called Higher Mathematics, which embraces topology or the theory of knots and surfaces, matrix algebra, the theory of numbers, infinite series and imaginary numbers, concepts which are a delight to the mind and a constant source of interest and wonder.

Mathematics leads straight on to Science: Physical Science obviously because atomic physics, concerning as it does changing states, has to be handled by the calculus, but also the biological sciences and, interestingly enough nowadays, clinical medicine which leans heavily on the science of applied mathematics called statistics. I could hardly suppose that much

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of my scientific library would interest you, but I am lucky to possess copies of three classics. Karl Pearson's *Grammar of Science*, Darcy Thompson's *Growth and Form* in two splendid volumes and, more recently, Karl Popper's *Logic of Scientific Discovery*.

There are books on Astronomy, Nuclear Physics, Chemistry and Genetics, and that curious child of the post-war epoch, Cybernetics; books which I go back to again and again, and each time that I read them I get something more from them. But my treasures are large excerpts from Darwin in *The Darwin Reader* and extracts of the *Novum Organum* of Bacon.

Leading on to Philosophy, there is *The Discourse on Method* by René Descartes, and, of the moderns, there are some of the more gentle selections from Eddington, Jeans and Einstein. I suppose, as we get older, Philosophy exerts an increasing attraction. I cannot recall as a young man being much concerned with the techniques of philosophical thought, although I suppose like all young men I engaged in conversations far into the night on the meaning of life, of aesthetics and of the after-life, but this was all "airy fairy" talk and without substance. As I write these words, however, I can see on my shelves many of the philosophical works of Bertrand Russell, *The History of Western Philosophy* and *The Wisdom of the West*; *The Social Philosophers*, and *The Philosophers of Science* together with one superb American book called *The History of Philosophy* by Will Durant. These books are some of my closest and deepest friends. One particularly I should draw to your attention—*The Phenomenon of Man* by Pierre Teilhard de Chardin. This is a work which forms the best link with religion. Written by a Jesuit with a scientific training, it traces the history of the world from remote geological times to the present, and predicts the future. It is not an easy book and has met with much criticism from such experts as Professor Medawar, who profoundly disagree with the method of presentation and with the philosophical conclusions which are drawn. Others think it is the book of the century and it certainly cannot be ignored. I must confess that I have read it only once. If one had only met a friend once it would be unwise to express any opinion on his worth, how long the friendship would last and what influence he will have on one's thinking.

At this juncture in any lecture, if I am in the audience, I have only one thought in my mind, or at least there is one thought uppermost in my mind and that is—when is this going to stop? I can give you the assurance that I have nearly finished. I should like to have discussed with you—in a friendly way—the subject of Religion, as an important section of my library is devoted to this, but I have reluctantly come to the conclusion that this would be unwise. If I had been going to do this then perhaps the whole of this oration should have been devoted to it; now it would imply too abrupt a transition in mood, and time is too short for an adequate treat-

ment. I might, however, quote from Eddington's essay on *Science and Mysticism* which illustrates the complete change in attitude of mind which we would have had to adopt if we were to consider these grave matters.

One day Eddington was occupied in studying the generation of waves and their maintenance against viscosity by suitable forces applied to the surface. He read, "If the external forces p'_{vv} , p'_{zy} be given multiples of e^{zk+at} , where b and a are prescribed, the equations in question determine A and C and then by the value of η we find

$$\frac{p'_{vv}}{g\rho\eta} = \frac{(a^2 + 2vk^2a + a^2) A - i(\sigma^2 + 2vkma) C}{gk(A - iC)}$$

What food for thought! What hours of concentration and pleasure were evoked by these expressions! On another occasion the same subject "The Generation of Waves by Wind" was in his mind, but he took down another book and there he read:

"There are waters blown by changing winds to laughter
And lit by the rich skies, all day, and after
Frost, with a gesture, stays the waves that dance
And wandering loveliness. He leaves a white
Unbroken glory, a gathered radiance,
A width, a shining peace, under the night."

Eddington was one of those men whose minds were sufficiently ambivalent that he could receive stimulus from the one message and joy from the other. If you can appreciate the relevance, you will see that, if we were to treat with Religion, we should really "take down another book" perhaps "on another occasion".

So we come to the final section—Travel, and books about foreign countries.

Nothing is more delightful than travelling from the armchair of one's library—no tickets or passports, no travellers' cheques, or inoculations against cholera and yellow fever, no abrupt changes of temperature, no alarms and excursions; one would think that it was the ideal way to get about. Indeed, I have visited nearly every corner of the globe in this way. Through the agency of the ubiquitous John Gunther, I have been "Inside . . ." almost everywhere and could at one time have told you the population of Omsk and the temperature ranges of the Mojavi desert. Yet from these excursions much is missing. Firstly there are the friends that are made on such travels, sometimes companions in misfortune or discomfort, the memory of which is a bond for ever. For instance the companion in second class couchettes on the long rumble from Calais to somewhere in Middle Southern Europe share an experience which unites them indissolubly in the recollection of miseries bravely shared. I refer particularly to the occupants of the bottom of the three tiers of bunks which has a gap between it and the compartment wall out of which the

traveller painfully scrambles at hourly intervals throughout the night. Then there was the famous Cambridge don—I forbear to mention his name in respect for his eminence—who whilst in Athens agreed to come with my wife and me to witness a Greek tragedy. He should have known better, but we in our ignorance believed that, although we knew no word of Greek, we could, by attending the first half and escaping in the interval, yet capture the atmosphere and enjoy a unique experience. The play was *Hercules Furiens* by Euripides to be performed in the Theatre of Herodes Atticus and the night was at the full moon. The guide-book told us that the play would last one and three-quarter hours so we resolved to stay an hour. On arrival, having forgone anything to eat in order to get there in plenty of time, we were enthralled at the setting; the “back-cloth” (the ruins of the ancient theatre), the marble floored semi-circular stage, the amphitheatre rising up behind us and, in the distance, the full moon shining on the Parthenon. We did not at first notice that the seats were of unpadded marble and only nine inches raised from the floor, so enchanting was the scene. For an hour we sat delighted, and, although not understanding a word, were yet able to follow the action and to marvel at the acting. At the 70-minute mark, however, it was quite clear that there was not going to be an interval; after two hours, and Hercules had not yet murdered even one of his children, let alone his wife, it was clear that we were in for a long stay. By two and a half hours (curse the guide-book!) every portion of our anatomies which could possibly make contact with the marble seat had been tried out and discarded, and the donnish borborygmi were threatening to disturb the action of the play. After close on three hours, however, we saw, like mariners in a storm discerning the harbour lights, the bodies of Hercules’ wife and children indubitably dead, and within minutes the actors had taken their bows and we stumbled out into the night to devour a most unclassical meal of hamburgers and Coca-Cola from a hot-dog stand.

And yet . . . and yet even if we had known the trials which we were to endure we should have gone again and again. There was a beauty and a sincerity in the performance which will linger as a memory long after the discomforts have been forgotten. If there is a moral to this story it is simply to take a cushion with you when going to a Greek tragedy, a precaution which everybody else in the audience had prudently assumed.

But how tough the Athenians of the Periclean age must have been! Their day at this theatre consisted of three tragedies and a satire, not under the soft luminence of the moon, but throughout the heat of the day under the merciless Mediterranean sun—the Spartans under Leonidas at Thermopylae were no bolder!

Then there are the books about South Africa, that lovely country weaving for itself deep tragedy in a setting of natural loveliness unsurpassed anywhere in the world. I should prefer not to discuss this sombre topic.

HEDLEY ATKINS

Before going there I was steeped in Alan Paton, Father Huddleston and Canon Scott; I knew the answers. Now, having seen the situation at first hand, I know there is no answer so facile, so simple as these good men extol. No country that I have visited contains so much beauty and so much ugliness. Perhaps the most beautiful things in the Union of South Africa are the animals, and one of the most wonderful experiences of my life has been to visit the Kruger National Park and to enjoy seeing there creatures in their natural setting. No race which can care so much for its animals can be without hope, and one can only trust that wisdom can be distilled from the glories of the land to solve the aching problems of this great country.

Then there are the dangers of real travel, but they too may have their compensations, and sometimes in circumstances such as these we get a glimpse of the true nobility of human nature. There was an incident in an aeroplane—I shall not bother you with the details, but we were circling round far out in the Atlantic discarding fuel preparing to make a forced landing due to a leak in the hydraulic system—upon which as you know almost everything in an aeroplane depends, including the brakes.

The kerosene—thank goodness it was kerosene and not petrol—was cascading out of the wings and flickering in the navigation lights like some illuminated waterfall at a Jamaican restaurant. In the cabin the ventilators had been turned off and the heating had been turned off to conserve every scrap of pressure for the landing. It was just above 0° Fahrenheit on the ground and well below at 4,000 ft. so that the cold was intense. When eventually we landed—far out on the edge of the airfield, so that any nasty mess would not interfere with the natural flow of traffic or horrify other travellers, we were immediately surrounded by about half-a-dozen fire engines and ambulances which had been hovering like vultures by the side of the landing strip. And the point of the story? Well it is this. On the plane there were three air hostesses, none of them out of their early twenties, none of them cast in the role of heroine, all from little homes in the suburbs of London and none of them having had any experience of trouble in the air before, but during that hour when we were circling round in the dark, jettisoning our load, but all the while losing pressure, the longest hour of my life, these three children quietly boiled up water for hot water bottles for the more elderly of the travellers, chatted pleasantly, but not extravagantly, with all and sundry and generally set such an example of splendid conduct that my admiration for the "little people" of our race rose to the heights which I experienced during the air raids on London. I could hardly say, as in the case of *Hercules Furiens*, that this is an experience which I would willingly undergo again, but it is assuredly one that I was proud to have witnessed.

And so we come to Australia. Alan Lendon and others have given me books about Australia—*The Cobbers* by Thomas Wood; *The Sunburnt*

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Country by Ian Bevan and *Unique to Australia* by Bill Beatty. These I have enjoyed and, now that I am seeing something of your great country, I shall enjoy them all the more.

Real travel, as opposed to travel in a library, brings friends, and with all that Australia has had to offer us—its fine cities, its lovely coast, its great achievements in medicine and science and industry—it will be the friendships we have wrought which will be with me most vividly when on some foggy afternoon in the winter of our island I shall draw up the chair in my library towards the fire and take down from the shelves books about Australia and bask once more, though vicariously, in the sunshine of Brisbane and think once again of the friends that we have made in this warm inviting city.

As Abraham Cowley, the 17th century poet, has it:

“ Ah yet, e'er I descend to the grave
May I a small house and a large garden have!
And a few friends, and many books, both true,
Both wise, and both delightful too! ”

CHRISTMAS HOLIDAY LECTURES FOR SCHOOLCHILDREN PROGRAMME FOR 1961

Lectures

Friday, 22nd December	2.00 p.m.	“ The Romance of Surgery.” Lecture by Sir Reginald Watson-Jones, F.R.C.S., on “ Bone and Joint Surgery—its Science and Art.”
	3.15 p.m.	Lecture by Professor Ronald Woolmer, F.F.A.R.C.S., on “ New Methods of Life-Saving ” (with film and demonstrations).
	4.15 p.m.	Tea.

These lectures are suitable for boys and girls aged 12–18 inclusive. A limited number of adults may, if special application is made, be permitted to accompany the children.

Tours of the Museum

Thursday, 21st December	11.00 a.m. and 2.00 p.m.
Friday, 22nd December	11.00 a.m.

These tours, which will be limited to thirty persons on each occasion, will be conducted by Miss Jessie Dobson, Anatomy Curator, with the assistance of Professor Gilbert Causey, F.R.C.S., and Dr. R. M. Livingston.

Applications for tickets (admission free) to the Assistant Secretary, The Royal College of Surgeons of England, Lincoln's Inn Fields, London, W.C.2, not later than 18th December.

THE SELECTIVE ATTACK OF CARIES ON THE DENTAL ENAMEL

Charles Tomes Lecture delivered at the Royal College of Surgeons of England

on

21st July 1961

by

A. I. Darling, D.D.Sc., M.D.S., F.D.S.R.C.S., M.R.C.S.

Professor of Dental Medicine, University of Bristol

CHARLES SISSMORE TOMES was born in 1846 and died in 1928 at the age of 82. He was the son of a very distinguished father, Sir John Tomes, who had already made many outstanding contributions on dental anatomy and histology. In his father's house he met many of the leading scientists of the day and, under their influence and that of his father, it is hardly surprising that he too developed an interest in teeth which was to last throughout his life. His father was influenced particularly by Sharpey of University College Hospital, and at Oxford the son, Charles Tomes, became a student under one of Sharpey's pupils, Burdon Sanderson, to such effect that in 1866 he gained the only first of his year in Natural Science. From Oxford he went to the Middlesex Hospital and qualified for Membership of the Royal College of Surgeons and the Licence in Dental Surgery of the same College in 1869.

By this time he was already assisting in his father's researches. During his undergraduate days Darwin's *Origin of Species* was published (1859) and in the controversies which followed many of his father's friends were conspicuous. Charles Tomes became tremendously interested in the new theory, particularly so as he realized the value of odontology in the study of phylogeny and evolution. This was the basis of his own studies on comparative dental histology. Throughout the next 30 years or more he published a series of monographs and papers on this subject and in 1878, at the age of 31, he was elected to a Fellowship of the Royal Society for his distinguished contributions.

He was a keen collector of dental specimens and added greatly to his father's collection which he later gave to the Royal College of Surgeons, where it forms a most valuable part of the Odontological Museum.

He was a great teacher and a true enthusiast as many of his old students have recalled. But he was not a full-time research worker or teacher, he practised his profession with such distinction that he became Surgeon Dentist to the King and in 1919 he was knighted as his father before him.

Above all else Charles Tomes was a dentist with a burning interest in the sciences which underlie the practice of dentistry.

Perhaps his greatest memorial is his book *A Manual of Dental Anatomy* (1904), which deals with both comparative and human dental anatomy and histology. This was a classic in its day and well repays the careful study of anyone interested in this subject even to-day.

THE SELECTIVE ATTACK OF CARIES ON THE DENTAL ENAMEL

Here in the section on human dental enamel in the edition of 1904 one finds the following comments :

"The actual structure of the enamel, which might have been thought a sufficiently simple matter of observation, is even yet not settled. It is an example of the difficulties which beset any observation of structures which have a high refractive index, and which are difficult to reduce to extreme thinness. Deceptive appearances may arise from the thickness of the section, from diffraction lines and other effects, from other than critical illumination, and from the smallest alteration of focus, so that with high powers there is always left a doubt as to the proper interpretation of that which appears to be seen."

This appreciation of the problems underlying the understanding of enamel structure was written by Charles Tomes some 60 years ago, but it could be repeated to-day without modification as a reasonable assessment of our knowledge of the histology of enamel.

Charles Tomes came of a family which had been settled in Long Marston in Gloucestershire since the reign of Richard II. The name is sometimes rendered as Toms.

It is perhaps not inappropriate that I, coming to-day from a school on the borders of Gloucestershire where the name of Toms or Toms is still to be found on the students' register, should offer, as the subject for this Charles Tomes Lecture, one aspect of the study of human enamel and its structure.

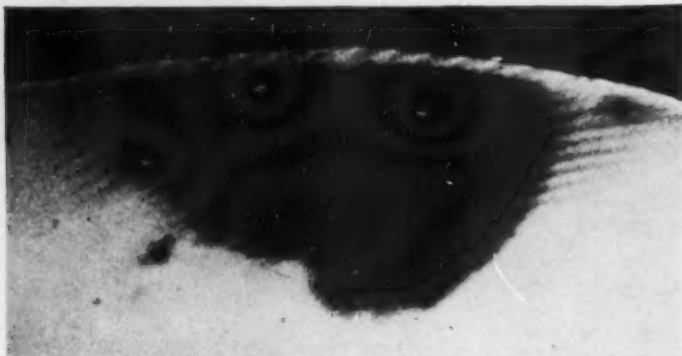
It is now generally recognized that both decalcification and proteolysis play their parts in the destruction of dental enamel by caries, but it was not till quite recently that it was shown (Darling, 1956) that histological evidence of proteolysis can only be found long after decalcification is well established. Indeed, it seems most probable that the proteolysis of the insoluble matrix, which is seen in the histology of decalcified sections of the enamel from carious cavities, only begins at or about the time when the enamel surface begins to disintegrate. It is therefore necessary to examine the process of decalcification most carefully in trying to discover the initial attack.

The initial attack

In 1932, Applebaum demonstrated decalcification of the enamel in caries by means of microradiography and found that in early lesions, before cavitation, the surface zone of the enamel appeared to be unaffected while the underlying enamel was appreciably decalcified. By the examination of later lesions using similar techniques, it has now been shown that points of decalcification develop in this surface zone at a relatively late stage (Fig. 1) (Darling, 1958), and it seems probable that these are the later manifestations of the original paths of entry through the surface zone, and that here the process of decalcification is much slower, or is delayed, in relation to the decalcification of the deeper enamel. These paths of entry appear to follow the striae of Retzius.

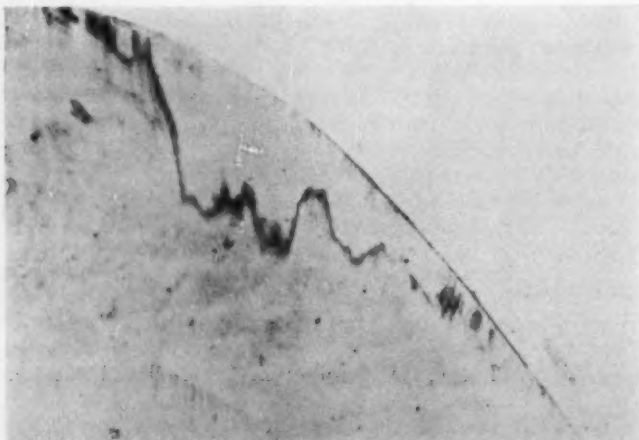
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Such demonstrations in the later lesion when used to deduce the paths of entry are susceptible to misinterpretation. It was therefore necessary to trace the lesion of enamel caries back to its earliest stage to discover



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Fig. 1. Microradiograph of ground section of carious lesion of enamel showing the points of entry through the surface zone in relation to the striae of Retzius. ($\times 70$.)



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Fig. 2. Ground section of approximal caries showing the three zones of enamel caries, seen by transmitted light, and mounted in quinoline. ($\times 30$.)

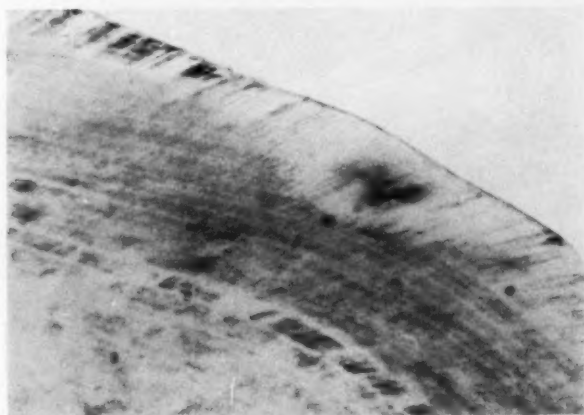
the initial attack. To do this the appearances of the established and clinically recognizable lesion of interproximal enamel caries were defined by histology in media of various refractive indices. The microradio-

THE SELECTIVE ATTACK OF CARIES ON THE DENTAL ENAMEL

graphic appearances were also established (Darling, 1956, 1958). The earlier clinical lesions of interproximal caries were then matched against these standards and the modifications which might be expected in very early lesions at the same site were deduced. From this study it was expected that the body of the lesion (Fig. 2) would contract in the earlier lesions until eventually it would disappear, when the dark zone around its margin would fuse into a solid dark zone in the centre of a translucent zone. Then it seemed reasonable that the dark zone should disappear, leaving only the translucent zone.

Each stage was found as expected and behaved also as expected in the various methods of examination (Figs. 3 and 4) (Darling, 1958).

The earliest lesion demonstrated by this means consisted of only a translucent zone in the enamel just below the contact point of a premolar



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Fig. 3. Ground section of very early approximal caries showing a central dark zone surrounded by a translucent zone. The body of the lesion is absent. Seen by transmitted light, and mounted in quinoline. ($\times 58$.)

(Fig. 4). As with other translucent zones in caries it was not possible to detect in it any loss of calcium salts by microradiography or intrinsic birefringence. The attack was so slight that the spaces which it produced in the enamel could only be demonstrated when they were imbibed with air to render them opaque. This is because of the great difference in refractive index between enamel and air (Darling, 1958).

When so demonstrated, it is seen that the pathways of this very early attack follow the striae of Retzius through the surface zone of the enamel (Fig. 5), precisely as was shown in later lesions by microradiography (Fig. 1).

Microradiography of the established lesion

When the lesion has spread deeply into the enamel, it is then possible to demonstrate the spread of decalcification by microradiography as was done by Applebaum (1932). Recently, however, by close application of the ground section to the plate and the use of carefully judged exposures it has been possible to demonstrate the pattern of this spread in relation to the prisms (Darling, 1958, 1959; Miller, 1958). From such examinations it can be seen that the main spread of decalcification is found along the striae of Retzius (Fig. 1), from which it tends to spread into the overlying enamel. Only occasionally does it seem to spread into the deeper enamel beneath the striae. In spreading from the striae of Retzius it can



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Fig. 4. Ground section of very early approximal caries showing only a translucent zone. The body of the lesion and the dark zone are both absent. Seen by transmitted light and mounted in quinoline. ($\times 54$)

be shown that the earliest evidence of decalcification is found in the cross-striations and then in the prism core. The prism cortex remains relatively unaffected (Figs. 6 and 7).

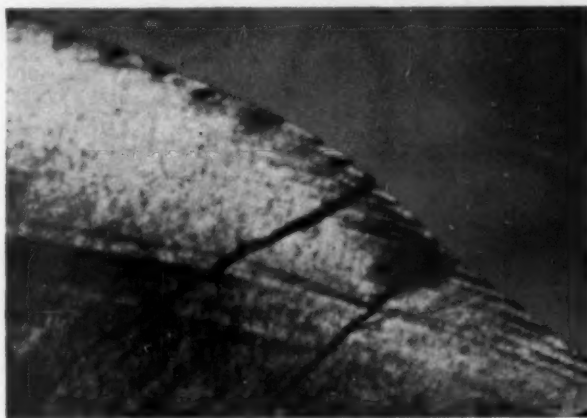
This leaves a gap in the pattern of spread between the striae of Retzius and the cross-striations, but the pattern can be completed by the use of polarised light in conjunction with various media to demonstrate the spaces produced by the carious lesion as described later. By this means it can be shown that, before the cross-striations are involved, spaces are produced in the interprismatic regions and penetrate along these, parallel to the prisms (Fig. 8). At a slightly later stage spaces appear in the cross-striations and from these spread along the prism core.

THE SELECTIVE ATTACK OF CARIES ON THE DENTAL ENAMEL

Thus the progress of the attack is apparently from the striae of Retzius via the interprismatic substance to the cross-striations and the prism core.

The existence of such pathways of attack by caries means that there is a selective attack on the structures within the enamel. The structures which are susceptible to attack are the striae of Retzius, the interprismatic substance, the cross-striations, and the prism core, while the structures which are relatively resistant to attack are the surface zone, the zones beneath the striae of Retzius, and the prism cortex.

It seems obvious that such a selective attack must imply some chemical, physical, or physico-chemical difference between the two groups of structures. As the differential attack is manifest chiefly in susceptibility to



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Fig. 5. Same specimen as Figure 4 mounted in air seen by polarized light. The translucent zone seen in Figure 4 is now opaque as the spaces are filled by air. ($\times 61$.)

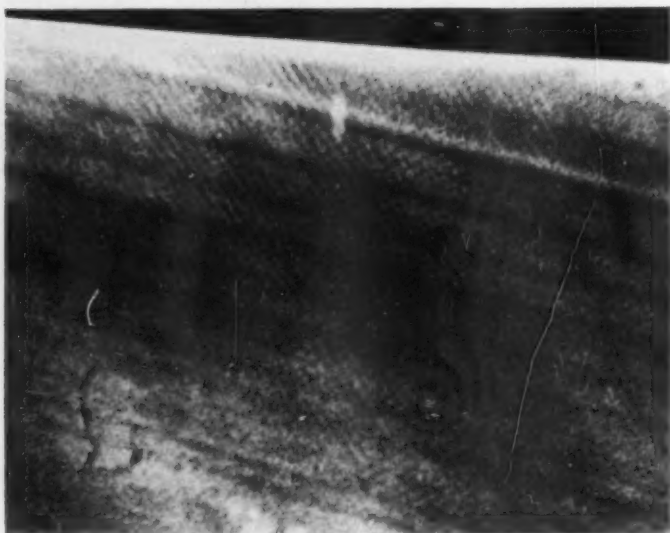
decalcification it might be expected that the difference between the two groups would lie in their inorganic constituents. So far, no inorganic difference has been demonstrated. If one then turns to the organic constituents of enamel, Stack (1954) has demonstrated two main organic fractions, one of which is very resistant to solution, while the other is readily soluble in dilute acids and many other solvents. It is quite clear that those structures resistant to carious decalcification are all associated with the relatively insoluble fraction of the organic matrix, as can be seen by comparing their distribution with the distribution of the insoluble matrix as seen in decalcified sections of mature enamel.

Those structures susceptible to the attack of caries are all closely related and interconnected. The cross-striations connect the interprismatic

A. I. DARLING

substance and the prism core, while the striae of Retzius are associated with an enhancement of both the cross-striations and the interprismatic markings. Each of these structures shows very little, if any, organic matrix in decalcified sections of mature enamel and each has a similar form of matrix during development as seen by the electron microscope. This matrix is of a type different from that found in association with the resistant structures (Little, 1959).

There appears to be a direct association between the susceptibility of enamel structures to carious attack and the solubility of the associated organic matrix.



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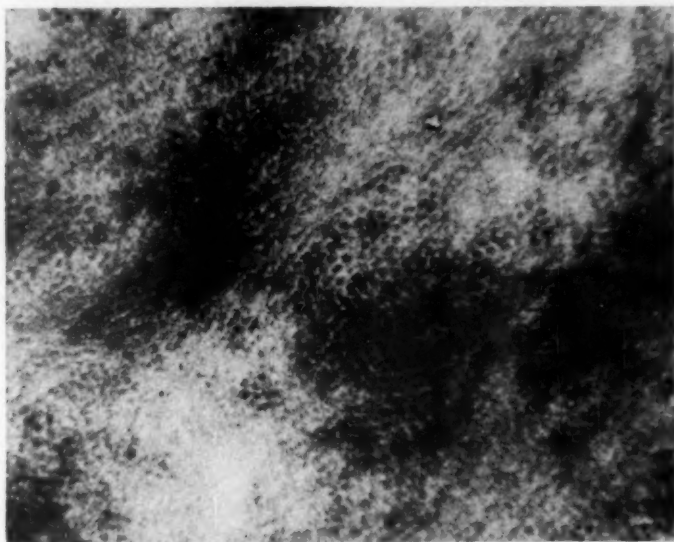
Fig. 6. Microradiograph of ground section of enamel caries cut longitudinally to the prisms, and showing selective decalcification. ($\times 350$.)

Rowles (1955) has shown that in the decalcification of powdered enamel the first fraction to be dissolved is organic and has characters suggesting that it is Stack's soluble organic material. After this there is a rapid solution of a considerable amount of the inorganic salts, then a much slower solution of the remainder, leaving finally an organic residue corresponding to the insoluble organic matrix. This seems to support the theory that the facilitation of, or resistance to, the carious attack may depend on the nature of the organic matrix of the enamel structure.

Histology of the established lesion

It is generally agreed that there are three main zones in the early carious lesion of enamel as seen histologically, usually in Canada balsam (Fig. 2). These are the translucent zone at the advancing edge of the lesion, though it is not always present; the dark zone, which is opaque and lies just inside the translucent zone, and the body of the lesion, which fills the centre of the lesion and is usually transparent.

The translucent zone and the body of the lesion when immersed in various media of different refractive indices behave as would be expected from our knowledge of the tissue. They are both completely translucent



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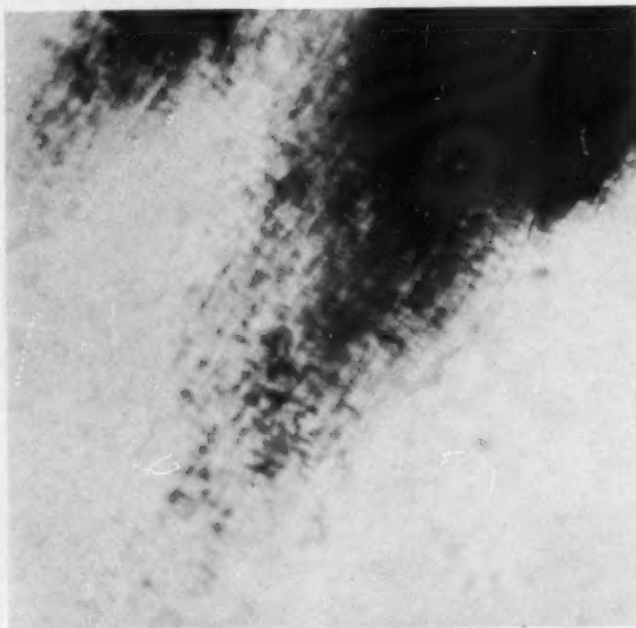
Fig. 7. Microradiograph of ground section of enamel caries cut transversely to the prisms and showing selective decalcification. ($\times 350$.)

and show no form birefringence in media of the same refractive index as enamel (e.g. quinoline R.I. 1.62). They remain relatively translucent and show little form birefringence when the refractive index of the medium is close to that of enamel (e.g. balsam R.I. 1.54), but as the refractive index of the medium becomes more remote from that of enamel the opacity and form birefringence increase rapidly until the whole lesion is opaque and shows gross form birefringence (e.g. in air R.I. 1.00).

The dark zone, however, behaves in an unusual manner. In most non-aqueous media (e.g. quinoline or balsam) it is present and shows a very

high degree of opacity and form birefringence, while in aqueous media of the same refractive index it is usually completely absent (Figs. 2 and 9), acting in precisely the same manner as the other zones. In order to account for these effects it was necessary to presume that in aqueous media the spaces were filled by the medium, while in non-aqueous media the spaces were filled with air or vapour (Darling, 1956).

At first it was suggested (Darling, 1956) that the effects produced by non-aqueous media were the result of dehydration by ethyl alcohol in the passage from aqueous to non-aqueous media, but it was noted that



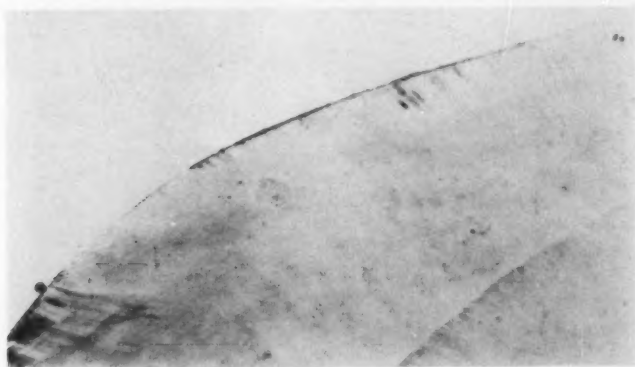
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Fig. 8. Ground section of enamel caries mounted in water and seen by polarized light. It shows the advance of the lesion in relation to enamel structures. ($\times 640$.)

methyl alcohol, which is itself a potent dehydrating agent, failed to produce the dark zone and behaved in the same manner as an aqueous medium. A new explanation was sought, and as a result of closer investigation of the changes involved in transfer from aqueous to non-aqueous media it was shown that the presence and intensity of the dark zone was not dependent on the type of medium but on its molecular size (Poole *et al.*, 1961).

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This was confirmed by drying the specimens in air and then imbibing them with a series of alcohols of graduated molecular size but similar refractive indices. The intensity of the dark zone was measured in each medium by its form birefringence. This was found to be related directly to the size of the molecule of the medium (Poole *et al.*, 1961; Darling *et al.*, 1961). By this means it was shown that the dark zone is in fact a molecular sieve. It contains a series of spaces of graduated sizes, the smallest of which will admit only molecules as small as those of water and methyl alcohol, while the largest will admit molecules as big as or bigger than those of quinoline or balsam. In between these extremes are spaces of various intermediate sizes. Thus when a ground section of caries is thoroughly dried and immersed in a medium of refractive index similar to that of enamel but of large molecular size the molecules can only penetrate the large spaces and the small spaces remain filled with air. As the refractive



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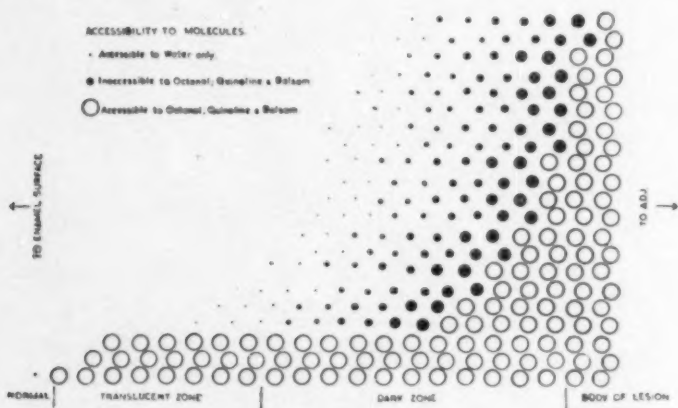
Fig. 9. Same specimen as seen in Figure 2, seen by transmitted light but mounted in Thoulet's aqueous medium. (1.62.) ($\times 30$.)

index of air (1.0) is very different from that of enamel (1.62) this causes opacity or, in polarized light, form birefringence. When the same specimen is immersed in a medium of small molecular size the molecules penetrate all the spaces both large and small and if the medium has the same refractive index as enamel (e.g. Thoulet's solution 1.62) then no opacity or form birefringence is produced and no dark zone can be found.

On this basis, using polarized light and a series of media of various molecular sizes and refractive indices, the approximate amount of the total spaces can be assessed and some idea of the amounts of the spaces which admit each size of molecule can be obtained (Darling, 1958; Darling *et al.*, 1961). By this means it can be shown that the translucent zone contains about 1 per cent. of spaces, the dark zone 2-4 per

cent. of spaces and the body of the lesion 5 per cent. or more of spaces. As opposed to the dark zone which contains spaces of all sizes, the spaces in the body of the lesion are all large enough to admit the molecules of all the media used, while the spaces in the translucent zone are for the most part of similarly large size with the addition of a few small spaces which will admit only molecules of the size of the molecule of water.

From a preliminary examination of normal enamel it appears that when striae of Retzius, lamellae and other structural faults are avoided "normal" enamel contains about 0.1 per cent. spaces, all of which are too small to admit molecules bigger than the molecule of water (Darling *et al.*, 1961).



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Fig. 10. Diagram to show the arrangement of spaces in normal and carious enamel.

Interpretation of the findings

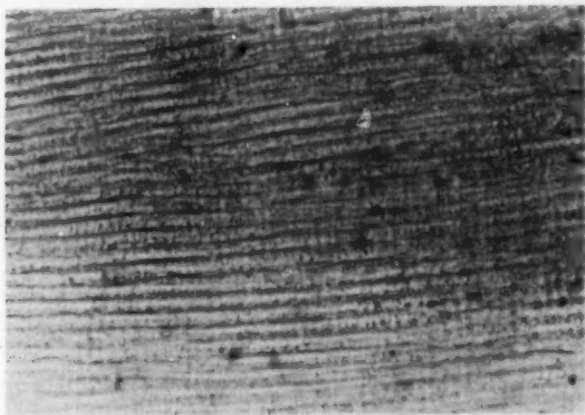
The arrangement of the spaces in normal and carious enamel is shown in diagrammatic form in Figure 10. From this it can be seen that the minute spaces of the dark zone appear to grow in size until they become the large spaces of the body of the lesion. The minute early spaces of the dark zone are so small that they could only be produced by the loss of inorganic molecules or radicles. This is consistent with the evidence of microradiography and intrinsic birefringence which show that the earliest evidence of decalcification is in the dark zone. Thus, it seems probable that the spaces in the dark zone and the body of the lesion are produced largely by decalcification and mineral loss.

The spaces in the translucent zone do not seem to follow this pattern. As previously stated, this zone contains some minute spaces accessible to

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the molecules of water, but the rest of the spaces are big enough to admit the largest molecules used (e.g. quinoline and Canada balsam). There are no spaces of intermediate size between these two extremes (Fig. 10). Thus it appears that the large spaces did not grow to this size as in the dark zone but developed in one stage. There are therefore two distinct processes in the development of the spaces in the carious lesion. The earlier is the production of large spaces which begin as large spaces in the translucent zone, while the later stage is concerned with the development of minute spaces in the dark zone which grow to become the large spaces of the body of the lesion.

The characteristic appearance of the translucent zone in Canada balsam and quinoline is produced by a loss of the structural markings seen in normal enamel (Fig. 2). These structural markings in normal enamel,



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Fig. 11. Ground section of normal enamel mounted in quinoline (R.I. 1.62) by transmitted light. ($\times 280$.)

especially the interprismatic markings lying between the prisms, are present in Canada balsam and quinoline (R.I. 1.62), but are lost in the aqueous medium of Thoulet (R.I. 1.62) (Figs. 11 and 12). As previously stated, "normal" enamel contains about 0.1 per cent. of minute spaces, accessible only to molecules of about the size of the molecule of water. Thus it must follow that the structural markings are caused by collections of minute spaces at these sites. When immersed in an aqueous medium of R.I. 1.62 the spaces are penetrated by the medium and are invisible (Fig. 12), but when dried and immersed in a medium with large molecules, e.g. quinoline or Canada balsam, the medium cannot penetrate the spaces and they remain filled with air, which makes them visible as slightly opaque markings (Fig. 11).

A. I. DARLING

The practical implications of these observations were well known to the early dental histologists who used to dry their sections thoroughly in a warm oven before mounting them in treacly Canada balsam. This ensured that the spaces remained filled with air and showed up the structural markings.

In the translucent zone, when viewed in any medium, these markings are lost even in media with such large molecules as quinoline and Canada balsam. This can only be because the minute spaces which cause the markings in normal enamel have themselves been lost. Spaces are still present in these sites as can be seen when the specimen is dried and all spaces are filled with air to render them visible. Thus the only reasonable explanation is that the small spaces of "normal" enamel have been engulfed by the large spaces produced in the translucent zone and that these



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Fig. 12. Same specimen and same field as Figure 11 seen again by transmitted light but mounted in Thoulet's aqueous medium. (1.62). ($\times 280$.)

large spaces are accessible to even the largest molecules used. As previously stated, lack of intermediate sizes of spaces between the two extremes in the translucent zone must mean that the small spaces did not grow to this size but arose as large spaces which engulfed the small ones. This difference in the type of spaces and the stages of development of the spaces, between the dark zone and the translucent zone, makes it clear that the development of the translucent zone and of the dark zone are two separate stages of the carious attack which are quite different in character.

The production of the large spaces in the translucent zone in a single stage suggests that they are caused by the removal of large fragments from the enamel structure and points towards the loss of organic molecules

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which are generally large, rather than inorganic molecules or radicles which tend to be small. This view is further supported by the fact that so far it has been impossible to demonstrate any loss of mineral from the translucent zone by microradiography or by the estimation of its intrinsic birefringence (Darling, 1958; Wallace, 1961).

It appears that the evidence from microradiography and that from the estimation of the amount and size of spaces in enamel caries agrees in showing a selective attack of caries on the enamel structures. In seeking a satisfactory explanation of the evidence from these two methods of examination, it has been necessary in each case to postulate that the basis of the selective attack lies in the organic matrix and that the soluble matrix is lost first and may facilitate the solution of its associated mineral salts, while the insoluble matrix resists attack and in some way protects its associated minerals.

Testing the theory

This theory depends to a great extent on the belief that the initial stage of the lesion seen in the translucent zone of enamel caries is the result of loss of the soluble organic matrix. If this theory is true it should be possible to reproduce the translucent zone by extraction of the soluble organic matrix from enamel.

This was tried using cold ethylene-diamine. It was shown that cold ethylene-diamine, when acting on powdered dental enamel, removes organic material of an amount consistent with Stack's soluble organic fraction and leaves behind an organic fraction which in amount and properties is identifiable as the insoluble organic matrix. Further experiment demonstrated, as was expected from the literature, that the solubility of enamel minerals in cold ethylene-diamine is negligible. It is therefore most unlikely that cold ethylene-diamine, even when acting on whole enamel for periods up to 120 days, removes anything but the soluble organic matrix.

Teeth protected by wax, leaving only a window of enamel exposed to the effects of cold ethylene-diamine, developed lesions in the window areas. Lesions were not produced in controls.

The lesions are small but are selective in their points of attack within the window area. They usually attack in relation to striae of Retzius. When ground sections of the lesions are observed in balsam or quinoline they appear translucent, exactly as in the translucent zone of natural caries. The structural markings of the enamel are lost and, when the spaces are measured by the method used for natural caries, the spaces are found to be exclusively of the large size, big enough to admit the molecules of quinoline or Canada balsam. The lesions show no evidence of mineral loss by microradiography or polarized light. Recent work by Bradshaw

of Edinburgh (1961) with electronmicroscopy of replicas from ground sections treated briefly with ethylene-diamine, shows loss of interprismatic tissue as the result of this treatment.

Thus it can be shown that translucent zones can be produced in the enamel by the removal of the soluble organic matrix. These zones are similar to the translucent zone of natural caries in the loss of structural markings, in the size of the spaces produced, in the absence of any demonstrable loss of mineral salts, and in their sites of occurrence in relation to the striae of Retzius.

It cannot be said that ethylene-diamine lesions are produced in an identical manner to that of the translucent zone of natural caries, but the evidence provides excellent support for the theory deduced from two separate approaches to the problem, that the first evidence of the attack of caries on the dental enamel is the loss of the soluble organic matrix.

It has been shown that the process of dental caries most probably enters through the enamel surface via the striae of Retzius. Having reached the underlying enamel it then spreads along the striae of Retzius and out from them into the immediately overlying enamel through the interprismatic substance, the cross-striations of the prism and the prism core in this sequence.

Within this anatomical pattern the carious process in the enamel shows various stages. In the first of these, large spaces are produced without evidence of decalcification. These spaces are big enough to admit large molecules, e.g. quinoline, and they arise as large spaces without growing. This is seen best as it affects the interprismatic areas in the body of the enamel to form the translucent zone. In the second stage minute spaces are produced. The smallest are only big enough to admit the molecules of water, but they grow through various sizes until they are eventually big enough to admit even the molecules of quinoline and Canada balsam. These spaces are associated with evidence of decalcification and are probably produced by this means. The small and growing spaces are characteristic of the dark zone, while predominance of the fully grown large spaces is characteristic of the body of the lesion.

On the basis of this evidence and the evidence from the effects of cold ethylene-diamine it is argued that the initial attack of caries on the human dental enamel is probably a solution of the soluble organic material which is distributed chiefly in the susceptible structures. The loss of the soluble organic material produces the large spaces of the translucent zone. This precedes and may facilitate the solution of the associated mineral crystallites with the production of the minute spaces of the dark zone and evidence of decalcification. The remainder of the crystallites which are associated with the insoluble organic matrix remain relatively unaffected until, with the breakdown of the enamel surface, micro-organisms enter the enamel

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and cause proteolysis of the insoluble matrix and solution of the remaining crystallites.

All of this work, such as it is, is dependent on the work of others; Professor R. V. Bradlaw, C.B.E., who guided its earliest stages, colleagues at the Bristol Dental School, who have done much of the work, and technicians, especially Mr. B. G. H. Levers, who has ground many of the sections and prepared most of the photographs, and of course it owes much to the earlier work of the great dental histologists, among whom Charles Tomes stands very high.

It is perhaps of interest to note that he even described the appearances of enamel in polarized light (Tomes, 1898) and, given a little more time, might well have made this paper unnecessary. But of all his many achievements that which evokes my greatest respect is expressed in one of his obituary notices where he is described as "a marvellous technician in the grinding of sections".

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APPOINTMENT OF FELLOWS AND MEMBERS TO CONSULTANT POSTS

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LATE EPILEPSY AFTER BLUNT HEAD INJURIES

**A Clinical Study based on 282 Cases of Traumatic Epilepsy
Hunterian Lecture delivered at the Royal College of Surgeons of England**

on

23rd March 1961

by

W. Bryan Jennett, M.D., F.R.C.S.

Lecturer in Neurosurgery, University of Manchester

"IT HAS BEEN asserted almost universally that trauma may cause epilepsy; I have never been able to understand why."

Those are the words of Dr. Kinnier Wilson speaking in 1923, and referring to an association between head injury and subsequent fits which has been assumed since Hippocratic times. Few seem to share Wilson's scepticism, though few either have been able to discern any consistent pattern in the relationship between trauma and epilepsy.

The possibility of predicting the likelihood of epilepsy developing after a head injury is always of great importance to the patient and sometimes to his lawyer. They will be concerned also to know what course this complication is likely to take should it appear. Much has been written about epilepsy after gunshot wounds, but very little about civilian injuries. Trivial references abound as asides in papers on epilepsy and afterthoughts in papers on head injury, but few reports contain enough adequately documented information for useful conclusions to be reached. Indeed it is often hard to be certain from the published data just what kind of injuries are being discussed, how many cases have been followed up and for how long, and even what is taken to constitute traumatic epilepsy.

DEFINITION OF TERMS

I make no apology, therefore, for devoting some time to a definition of terms, and taking as uncompromising an attitude as Humpty Dumpty, whom, you may recall, said, "When I use a word it means just what I choose it to mean, neither more nor less."

Much of the confusion surrounding this subject stems from the free use of terms which do not enjoy a generally accepted connotation. Without a clear definition of certain key words the most esoteric study, however enlightening to its author, does little to extend our understanding of the problem.

A former distinguished fellow of this College, Percival Pott, put the matter before his readers in 1759 with arresting frankness, "General terms are made use of, by which no precise idea is conveyed, and the surgeon not clear in his own conception of the nature of the disease, is at a loss to account for it to others."

Definition of a head injury

For Denny-Brown (1941) this is "such injury to the skull as might directly or indirectly damage the brain, even when there is no unconsciousness (i.e. concussion)". But Munro (1938) believes that "no significant degree of cerebral damage can occur without loss of consciousness"; for him concussion is retrospectively defined as a head injury without symptoms, morbidity or mortality. *Concussion* is obviously not a very precise term. *Unconsciousness* might seem to leave less room for argument, but when of short duration its recognition depends on the reports of unskilled witnesses. *Amnesia* is a preferable phenomenon as it is determined by the doctor directly questioning the patient. The establishment of loss of memory, at least for the impact, was taken in this study as the minimum evidence for a head injury and was the criterion for the admission of doubtful cases to hospital. This recalls Wilfred Trotter's definition of concussion, as "an essentially transient state due to head injury which is of instantaneous onset, manifests widespread symptoms of a purely paralytic kind, does not as such comprise any evidence of structural cerebral injury and is always followed by amnesia for the actual moment of the accident".

Few authors enlighten their readers on the evidence by which they judge one injury to be more severe than another, yet many exclude cases of epilepsy as traumatic in origin because the injury was too mild. This is the fallacy of cyclical definition, rejecting a case as traumatic because the injury was not sufficiently severe, and so ensuring that only injuries of a certain severity lead to traumatic epilepsy. This study applies to all cases admitted to hospital, however trivial the injury. But relative severities were distinguished by the duration of the post-traumatic amnesia (P.T.A.) which appears to provide a useful indication of the severity of an acceleration-deceleration injury; for example in one study it correlated closely with the length of time elapsing before return to work after injury (Symonds and Russell, 1943).

The term "blunt" injury is used in preference to "closed" lest a purist jib at the inclusion of compound depressed fractures. The important distinction is between high-velocity penetrating wounds, such as are caused by missiles, and acceleration-deceleration injuries whether open or not. By implication many studies seem to consist of a mixture of these types, but this paper is concerned exclusively with the latter type of injury.

Definition of epilepsy

There is no generally accepted classification of seizures. Two types were recognized here, non-focal and focal, using Penfield's definition (1954) of a focal attack as one with a recognizable origin in an area of one cerebral hemisphere, no matter how widely the seizure activity ultimately spreads. Many patients had more than one type of fit, but if any was focal then the

patient was put in the focal group. The proportion with focal attacks was a minimal estimate, as it is in any series of epileptics, for some patients were excluded from this group because there was insufficient evidence of a focal origin, rather than because of incontrovertible evidence that the attacks were non-focal.

Temporal lobe epilepsy demands comment as its frequency is being increasingly recognized, with the resulting acceptance of many phenomena as epileptic which have hitherto been attributed to other mechanisms. In the context of a florid post-concussional syndrome automatisms and other episodic anomalies of behaviour might readily be regarded as psychological and momentary amnesias confused with positional vertigo.

Some authors (Denny-Brown, 1943; Symonds, 1935) imply that post-traumatic vertigo may suffer a transition into frank epilepsy. However, vertiginous disorders following blunt head injuries are very common, often related to posture and consistently disperse with time. Their very frequency ensures that they will have been the concern at some time of a number of patients subsequently developing epilepsy. Yet they are so very rarely associated with the many other conditions which give rise to epilepsy that the case for a close connection between these two phenomena seems insupportable.

Definition of traumatic epilepsy

The relationship between a fit and a preceding injury can rarely be more than presumptive. The severity of the injury has already been dismissed as irrelevant and a close relationship between the two events in time adds nothing to the precision of the definition. What is important is to exclude pre-existing epilepsy and other conditions which might predispose to fits. Patients and relatives were closely questioned and any suggestion of previous epilepsy in a patient led to his exclusion from the study. The recognition of brain tumours, arteriosclerosis and the like rested on clinical examination by a neurologist or neurosurgeon, a skull X-ray and an E.E.G., with further investigations in some. As the underlying condition in symptomatic epilepsy usually declares itself within a year or so of the first fit, a follow-up for some time will further insure against the unwitting inclusion of such cases; many of the patients in fact were observed for several years after the onset of epilepsy. As in most previous studies a single fit was sufficient for inclusion as a traumatic epileptic, but there were few such cases. When there was doubt as to whether a fit had occurred the appeal was always to clinical evidence and not to the E.E.G.

A distinction was made between early and late traumatic epilepsy, the former referring to fits occurring within the first week after injury. They have been the subject of another communication (Jennett and Lewin, 1960) based on 46 cases at Oxford, and of further studies, on over 100 cases of early epilepsy (Jennett, 1961).

LATE EPILEPSY AFTER BLUNT HEAD INJURIES

It was discovered that at least one fit occurred within a week of injury in 4.5 per cent. of an unselected group of 1,000 head injuries admitted to the Radcliffe Infirmary, Oxford, with no previous history of epilepsy. Fits more commonly developed after injuries involving more than 24 hours' P.T.A., but only when associated with a fractured skull. A fracture whether linear or depressed was liable to be followed by early epilepsy, particularly if there had been more than 24 hours' P.T.A. Other features associated with a higher than average incidence of early fits were subarachnoid haemorrhage, extradural or acute subdural haematoma and the presence of neurological signs. More than half the patients with early epilepsy had some fits which were focal, most of them pure Jacksonian attacks. Over half the patients had more than one seizure and a fifth had serial attacks or status epilepticus.

This paper is concerned with *late epilepsy*, occurring after the first week, although some of the patients had had early fits as well.

MATERIAL AND METHODS

To make this a useful study there had to be large enough numbers, a certain minimum of information about each case and a substantial period of follow-up. The demand for numbers and prolonged follow-up precluded the possibility of this being a personal series, but the cases were gathered from three hospitals (The Radcliffe Infirmary, Oxford, and the Cardiff and Manchester Royal Infirmarys), in which I held posts, so that I was in a position to interpret the records with understanding.

I am indebted to those clinicians to whose case notes I have had access, the late Sir Hugh Cairns, Mr. Joe Pennybacker, Mr. J. C. Scott and Mr. Walpole Lewin in Oxford, Mr. Charles Langmaid and the late Professor Lambert Rogers in Cardiff, and the late Sir Geoffrey Jefferson, Mr. Richard Johnson and Mr. John Potter in Manchester.

The *incidence* of late epilepsy was assessed by following up for at least four years after injury cases which had been treated for their injuries in the hospitals mentioned. This yielded 58 cases of epilepsy.

To discover the *character and course* of late epilepsy a further 224 patients who presented with epilepsy and had a history of injury were studied. With the 58 above, this gave a total of 282 with late fits.

When the numbers allowed it the chi squared (χ^2) test of significance was used, and when the subgroups became too small for it to be valid a note was made that it was not applicable (NA). The convention adopted was that when $P < 0.05$ a difference was probably significant, $P < 0.01$ was significant, and $P < 0.001$ was highly significant.

INCIDENCE OF LATE EPILEPSY

Estimates in the literature vary widely, from 21 per cent. to fractions of 1 per cent., and this is inevitable when the number of variables is considered—type and severity of injury, length of follow-up, inclusion or not of early fits and so on. And it must be reiterated that these factors are seldom stated, so that allowance cannot be made for their influence. Denny-Brown (1943) maintained that the best figure then available was that given by Feinberg (1934), which was 0.1 per cent. of 47,130 injuries seen for insurance purposes. He answered the criticism that this must be too low, as it was less than the incidence of epilepsy in the population at large (usually given as 0.5 per cent.), by pointing out that an insurance company would initially exclude cases of existing epilepsy.

In the present study the absolute numerical incidence was based on a series of 1,000 consecutive admissions for head injury to the Radcliffe Infirmary, Oxford. Consisting as it did of all the injuries admitted to the only hospital serving a wide area, this represented as nearly unselected a group as was likely to be available. Time and funds allowed the follow-up of only 275 of the 896 survivors, and these included an unduly high proportion of severe and complicated injuries. This is an almost inevitable error in all follow-up studies on head injuries, and in defence of it may be brought the dubious wisdom and propriety of keeping mildly injured patients under prolonged observation. They are a group of people with litigious leanings, disposed to exaggerate their complaints, and are best helped by an early and unconditional discharge from hospital. However, as the nature of the injuries both in this group and in the whole unselected series was known in detail it was possible to allow for this bias, and reach by extrapolation an estimate of the incidence of epilepsy in an unselected series of injuries. This was 5 per cent. for patients followed for four years or more (Jennett, 1961), but it soon became clear that an overall figure such as this was of very limited value in prognosis, as the risk of epilepsy varied so widely with different types of injury. It must be remembered also how large a proportion of unselected injuries is mild, about two-thirds of this series of 1,000 having less than an hour's amnesia and almost as many having no fracture of the skull.

INFLUENCE OF VARIOUS FACTORS ON THE INCIDENCE OF EPILEPSY

Riddoch (1932) believed that *early fits* were no indication of the likelihood of late epilepsy, but Symonds (1935) thought they were associated with an increased risk though they did not often recur. Whitty (1947) found that early fits after missile injuries usually presaged late epilepsy. Symonds (1935) considered that *prolonged amnesia* was associated with a higher risk of late epilepsy, but Denny-Brown (1943) drew the opposite inference from his experience. Phillips (1954) supported Symonds's view.

LATE EPILEPSY AFTER BLUNT HEAD INJURIES

Depressed fracture has long been closely connected with traumatic epilepsy and English, a Hunterian lecturer in 1906, foretold that when operation for depressed fracture became routine traumatic epilepsy would become rare. As recently as 1950, Mock wrote that patients with traumatic epilepsy usually have depressed fracture. Phillips (1954) showed a high degree of correlation, with epilepsy occurring ten times more often after depressed fracture as in a total series of 500 closed injuries.

TABLE I
INFLUENCE OF EARLY EPILEPSY ON INCIDENCE OF LATE EPILEPSY

		Cases	Late epilepsy	Epilepsy (per cent.)
No early epilepsy	..	240	18	7.5
Early epilepsy	..	35	10	28.5
χ^2	..	..	NA	..

In the present study the incidence of epilepsy was determined by following up for at least four years groups of patients who had suffered different types of injury. As a check on this the frequency of these various types of injury among the 282 patients with late epilepsy was compared with the frequency of these types of injury in the 896 survivors of the unselected Oxford head injuries. Whenever a correlation between some feature of the injury and the incidence of epilepsy was indicated by one of these calculations it was also shown by the other method, and when one was not statistically significant the other usually was.

TABLE II
FREQUENCY OF EARLY EPILEPSY AFTER HEAD INJURY

	Total	Early epilepsy	Epilepsy (per cent.)
All surviving head injuries	896	38	4.25
Injuries with late epilepsy	282	40	14.2

Early epilepsy

This was the most important single factor contributing to a high incidence of late epilepsy, which occurred in 28.5 per cent. of 35 followed after an early fit, and in only 7.5 per cent. of 240 other cases (Table I). The increased risk of epilepsy when there has been an early fit is almost certainly greater than appears in this comparison, for the 240 cases used as a control included many with severe and complicated injuries, which, as will be shown shortly, predisposed to a high incidence of epilepsy. Only 4.25 per cent. of all head injury survivors had had early epilepsy, but 14.2 per cent. of those with late epilepsy had had an early fit (Table II). Moreover, this figure (14.2 per cent.) for the frequency of early fits among those with late epilepsy is almost certainly too low, because for many of the late cases incomplete details were available about the acute stage after their injuries, and it had to be assumed that they had had no fits.

This susceptibility to further fits after early epilepsy was equally evident after severe and mild injuries, whether or not there was a depressed fracture or intracranial haematoma, and was just as marked when the early epilepsy had consisted of a single fit as when it had taken a more severe form.

Severity of injury

Epilepsy was twice as frequent after injuries followed by more than 24 hours' P.T.A. as after milder injuries (Table III), and whereas only 17.5 per cent. of all survivors had severe injuries the figure for those with late epilepsy was 54.6 per cent. (Table IV). It seemed as though epilepsy was more prone to develop after prolonged amnesia. When, however, there had been an early fit there was a high rate of late epilepsy regardless of the duration of the P.T.A. (Table V). Following injuries without early epilepsy, and complicated by neither a depressed fracture nor intracranial haematoma, there was a very low incidence of late epilepsy even when there was more than 24 hours' amnesia (1-1.5 per cent.) (Table VI). It was clear that severity of injury, as judged by prolonged amnesia, was not by itself a factor predisposing to epilepsy.

TABLE III
INFLUENCE OF VARYING P.T.A. ON INCIDENCE OF LATE EPILEPSY

P.T.A.	Cases	Epilepsy	Epilepsy (per cent.)
< 24 hours	180	24	13.3
> 24 hours	133	32	24.0
χ^2 .. ..	..	..	5.0
P .. ..	..	..	<0.05

TABLE IV
DURATION OF P.T.A. IN SERIES OF HEAD INJURIES

	Total	> 24 hours P.T.A.	> 24 hours P.T.A. (per cent.)
All surviving head injuries	883	154	17.5
Injuries with late epilepsy	266	145	54.6

TABLE V
INFLUENCE OF EARLY EPILEPSY ON INCIDENCE OF LATE EPILEPSY WITH VARYING P.T.A.

P.T.A.	Cases	Early epilepsy Epilepsy	Epilepsy (per cent.)	Cases	No early epilepsy Epilepsy	Epilepsy (per cent.)
< 24 hours ..	36	19	53	144	5	3.5
> 24 hours ..	38	20	53	95	12	12.6
χ^2 .. ..	..	no difference	..	..	5.86	..
P .. ..	..	..	..	..	<0.02	..

TABLE VI
INFLUENCE OF VARYING P.T.A. ON INCIDENCE OF LATE EPILEPSY
(Injuries without Depressed Fracture, Haematoma or Early Epilepsy)

P.T.A.	Cases	Epilepsy	Epilepsy (per cent.)
< 24 hours	100	1	1.0
> 24 hours	68	1	1.5
χ^2 .. ..	..	..	NA

LATE EPILEPSY AFTER BLUNT HEAD INJURIES

Depressed fracture

Epilepsy was three times more frequent after a depressed fracture, 21.1 per cent. compared with 7.6 per cent. (Table VII); depressed fracture was four times more common in patients with late epilepsy as in unselected survivors (Table VIII). Just as prolonged amnesia alone did not predispose to late epilepsy, neither did a depressed fracture—it was only when there was prolonged amnesia that a high incidence of epilepsy was associated with depressed fracture (the figure being as high as 57 per cent. (Table IX)). After early fits depressed fracture did not add to the already high incidence of late epilepsy (Table X). A depressed fracture with less than 24 hours' P.T.A. and no early epilepsy carried an incidence as low as 3.1 per cent. Dural penetration led to a high incidence of epilepsy, namely 45 per cent. as against 15 per cent. for non-penetrating depressed fractures. But even when there was dural penetration the epilepsy rate was much higher if there had been prolonged amnesia. Indeed when penetration was associated with either prolonged amnesia or an early fit the risk of late epilepsy was very high indeed, about 80 per cent. The site of the fracture did not significantly affect the incidence of epilepsy, but then in blunt injuries the damage in the brain is much more widespread than in missile injuries, and the site of the fracture is of limited value in pointing to the site of damage.

TABLE VII
INFLUENCE OF DEPRESSED FRACTURE ON INCIDENCE OF LATE EPILEPSY

	Cases	Epilepsy	Epilepsy (per cent.)
No depressed fracture ..	223	17	7.6
Depressed fracture ..	52	11	21.2
χ^2 ..	..	..	7.0
P ..	..	..	<0.01

TABLE VIII
FREQUENCY OF DEPRESSED FRACTURES IN SERIES OF HEAD INJURIES

	Total	Depressed fracture	Depressed fracture (per cent.)
All surviving head injuries	883	64	7.2
Injuries with late epilepsy	226	65	29.0

TABLE IX
INFLUENCE OF P.T.A. ON INCIDENCE OF LATE EPILEPSY AFTER DEPRESSED FRACTURE

	P.T.A. < 24 hours			P.T.A. > 24 hours		
	Cases	Epilepsy	Epilepsy (per cent.)	Cases	Epilepsy	Epilepsy (per cent.)
No depressed fracture ..	143	20	14	112	20	17.9
Depressed fracture ..	37	4	10.6	21	12	57.0
χ^2 ..	..	..	NA	..	..	13.2
P ..	..	..	..	..	..	<0.001

TABLE X
INFLUENCE OF EARLY EPILEPSY ON INCIDENCE OF LATE EPILEPSY AFTER DEPRESSED FRACTURE

	Early epilepsy			No early epilepsy		
	Cases	Epilepsy	Epilepsy (per cent.)	Cases	Epilepsy	Epilepsy (per cent.)
No depressed fracture	60	30	50	196	11	5.6
Depressed fracture	15	10	66.6	44	7	15.8
χ^2 p		Not significant			NA	

Intracranial haematoma

Following this condition epilepsy was about four times as frequent as in the rest of the series, the incidence being 28.5 per cent. (Table XI). Haematomas were twice as frequent among patients with late epilepsy as in the unselected group of injuries (Table XII). There were not enough cases for a more detailed analysis.

TABLE XI
INCIDENCE OF LATE EPILEPSY AFTER INTRACRANIAL HAEMATOMA

	Cases	Epilepsy	Epilepsy (per cent.)
No haematoma	240	18	7.5
Intracranial haematoma	35	10	28.5
χ^2		NA	

Age

The incidence of epilepsy was the same for those under the age of 16 years at the time of their injury as for adults.

TABLE XII
FREQUENCY OF INTRACRANIAL HAEMATOMA IN SERIES OF HEAD INJURIES

	Total	Haematoma	Haematoma (per cent.)
All surviving injuries	896	42	4.7
Injuries with late epilepsy	282	32	11.4

CHARACTER OF LATE EPILEPSY

Time of onset

It is generally agreed that traumatic epilepsy usually begins within a year of injury, but figures quoted range from 47 per cent. in the first year (Vitale *et al.*, 1953) to 75 per cent. in the first three months (Walker, 1956). This variation depends in part on whether epilepsy confined to the first few weeks after injury is included, and on the length of the follow-up. The longer patients are followed the more there will be with a later onset to dilute the proportion occurring within the first year. The administration and subsequent withdrawal of anticonvulsant drugs may determine the timing of the first fit in some cases, and render spurious any speculations about traumatic epilepsy based on observations of the time of the first fit. Russell (1942) stated that although epilepsy often commences several years after missile wounds of the brain, it rarely develops more than two to three years after a closed injury.

LATE EPILEPSY AFTER BLUNT HEAD INJURIES

TABLE XIII

INTERVAL BETWEEN INJURY AND THE FIRST LATE FIT

Interval (months)	Cases	Per cent. of 282
<3	64	22.7
4-12	98	34.5
12-24	26	8.3
24-48	30	11.5

} = 57.2 within 1 year
 = 65.5 within 2 years
 = 77.0 within 4 years

Rather more than half (57.2 per cent.) of the present series of 282 patients began their *late* seizures in the first year after injury, 22.7 per cent. within the first three months (Table XIII). There proved to be almost twice as many cases in the present series with fits beginning in the first month and then persisting, as in the missile series of Russell and Whitty (1953) (25.4 and 14.5 per cent.). But there were also significantly more closed than missile injuries having their first fit between the second and fifth year (the limit of follow-up in the missile report).

A quarter of the patients with late fits began to suffer from epilepsy more than four years after injury, and this was a much higher proportion than was recorded for closed injuries by Phillips (3.4 per cent.). This disparity is readily accounted for, however, by the fact that most of his cases were followed for only two or three years.

TABLE XIV

INFLUENCE OF AGE ON INTERVAL TO FIRST FIT

Age	Interval to first fit			
	<1 year		>4 years	
	cases	per cent.	cases	per cent.
<16 years (73)	32	43.8	25	34.2
>16 years (209)	130	62.2	39	18.5
χ^2	..	..	6.75	
P	..	..	<0.01	

More important is that the present study fails to confirm his "negative period" between the 18th and 24th month, when not one of his 193 cases suffered their first fit. Certainly there was a rapid falling off in new cases after the 12th month, but during the second year the cases were fairly evenly spread. As the total series becomes smaller the more likely it is that by chance there will be a period in the second 12 months without any cases beginning to have seizures, but it seems unwise to ascribe a critical significance to any such period.

TABLE XV

INFLUENCE OF P.T.A. ON INTERVAL TO FIRST FIT

P.T.A.	Interval after injury			
	<3 months		>1 year	
	cases	per cent.	cases	per cent.
<1 hour (70)	21	30.0	19	27.0
>7 days (97)	9	9.3	47	48.5
χ^2	..	..	6.75	
P	..	..	<0.01	

There were few striking correlations with the time of onset. Epilepsy after injuries in children was more often delayed for more than a year than in adults (49.2 per cent. and 28 per cent.), and there were also more children beginning after the 4th year (34.2 per cent. and 18.5 per cent.) (Table XIV).

There was a longer latent period after severe injuries, which was pointed out by Phillips, who compared very mild injuries (< an hour's P.T.A.) with very severe (< 7 days' P.T.A.), although his figures did not attain significance. The proportions in the present series with epilepsy beginning in the first three months were 30 per cent. of the very mild and 9.3 per cent. of the very severe, and for cases with the first fit more than a year after injury the figures were 27 per cent. and 48.5 per cent. (Table XV); each of these differences is significant.

There was a greater tendency for the first late fit to occur within the year if there had been early epilepsy. Fits following a depressed fracture or intracranial haematoma did not favour any special period for their appearance.

Type of fit

About half the patients had some fits which were focal, at least at the onset of the seizure. Whereas early epilepsy took the form of pure focal motor attacks in 40 per cent. of patients this made up only 5 per cent. of late fits. Temporal lobe epilepsy occurred in 22 per cent. of the cases, and was the only type of seizure in a third of these. There was no correlation between the type of attack and the kind of injury, the form taken by early epilepsy when it had occurred, nor with the time or onset of severity of the late epilepsy.

Severity of epilepsy

The only numerically manageable way of assessing severity is by the number of attacks suffered in a given period. The very irregular pattern which attacks form in time renders invalid any assessment of severity based on brief periods of observation. Only the 198 cases followed for more than two years *after the first fit* were considered worth analysing for the severity of their epilepsy, and this excluded most of the 27 patients who had only one fit, the majority of which were observed for less than six months. To include such cases in a group claimed as having only infrequent or transient epilepsy, as some authors do, is to give a misleading overall view of the severity of this complication.

Half of the 198 were still having more than one attack a month, two years or more after the first seizure (Table XVI). However, the present series is undoubtedly biased towards more persistent cases, as many were included because they had presented at hospital for the treatment of continuing epilepsy. It is not possible from this study to say what proportion of patients develop disabling epilepsy, only that many do continue to have

LATE EPILEPSY AFTER BLUNT HEAD INJURIES

frequent fits for more than two years after the first one; it is unwise therefore to assume that this complication will be either mild or temporary.

When epilepsy began in the first three months after injury it tended to be more severe (Table XVII). Garland's view that the longer the latent period the more severe the epilepsy was not borne out, and neither was there any support for Phillips's contention about a strikingly different prognosis for fits beginning at different intervals after the injury. There was no other correlation with severity, which proved to be independent of the type of injury, the occurrence of early epilepsy or the type of fit suffered.

TABLE XVI
SEVERITY OF EPILEPSY IN 198 CASES FOLLOWED FOR >2 YEARS

Attacks	Cases	Per cent.
>1 per month ..	99	50
1-5 per 6 months ..	30	15
<1 per 6 months but persisting epilepsy	43	21.8
Epilepsy remitted ..	26	13.2

TABLE XVII
INFLUENCE OF INTERVAL TO FIRST FIT ON SEVERITY OF EPILEPSY

Interval to first attack	Total	> 1 attack per month	> 1 attack per month (per cent.)
<3 months	40	29	72.5
>3 months	158	70	44.5
χ^2 .. ..	..	..	9.75
P .. ..	..	..	<0.01

Remission of epilepsy

Ashcroft (1941) wrote that no case which began to have seizures more than two years after injury went into remission, whilst Walker (1956) contended that epilepsy tended to die out five years after the injury—contrary to Penfield, who held that "when there was an objective lesion of the brain permanent disappearance of attacks never occurred" (Penfield and Erickson, 1941).

The question of remission in epilepsy poses a problem in semantics. The longer epilepsy has been established the more hesitant is the physician to accept even a long period of freedom from attacks as justifying the term remission. However it is defined, the frequency with which remission occurs will only have meaning if all the cases have been "given a chance" of having a remission—that is, have been followed long enough. Of the 138 cases followed for more than five years after their first attack 26 were judged to have remitted, having regard both to the period of freedom from attacks and the duration of continuing epilepsy before the fits ceased.

TABLE XVIII

INFLUENCE OF INTERVAL TO FIRST FIT ON REMISSION RATE			
Interval	Total	Remission	Remission (per cent.)
<3 months and >4 years	60	9	15
3 months-4 years	78	17	21.8
χ^2	..	..	3.94
P ..	..	..	<0.05

This overall remission rate of 19 per cent. was not significantly altered by the type of injury, although there was a greater tendency for those who had had prolonged amnesia to go into remission. Cases went into remission no matter what the interval between the injury and the first attack, although there was rather less tendency to remit when fits began in the first three months or after the fourth year (Table XVIII). Most cases remitted after less than two years of continuing fits (77 per cent.).

CONCLUSIONS

Incidence of epilepsy

1. The incidence of late epilepsy varies so widely with the nature and course of the injury that the overall incidence of 5 per cent., for all blunt head injuries followed for four years or more, is of limited value in prognosis.
2. Early epilepsy was the most important single factor leading to a high incidence of late epilepsy, and this was so regardless of the type of injury.
3. Although epilepsy was more frequent after prolonged amnesia, this was only so when there had also been a depressed fracture or intracranial haematoma.
4. Depressed fracture predisposed to late epilepsy only when associated with prolonged amnesia. When there had been an early fit a depressed fracture did not add to the high risk of late epilepsy attaching to the early epilepsy. Depressed fracture without long amnesia or an early fit carried only a 3 per cent. risk of late fits. Dural penetration led to fits in a high proportion of cases, higher still when there had been prolonged amnesia.
5. Intracranial haematoma in the acute stage and chronic subdural haematoma were associated with a higher than average incidence of late epilepsy.

Character of epilepsy

1. Rather more than half the cases began within a year of injury, relatively few appeared in the second year, and a quarter did not commence until after the fourth year.
2. Fits more often began in the first year when there had been early epilepsy, or when the injury had been sustained after the age of 16.

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3. After mild injuries fits more often began within three months of injury, whilst after severe injuries epilepsy was more often delayed for a year or more.

4. Although half the patients had some fits with a focal component, pure focal motor seizures were very uncommon; almost a quarter of all patients had temporal lobe seizures.

5. Half the 198 patients followed for more than two years after the first fit continued to suffer fits more than once a month. Epilepsy of this severe type was more likely to develop when the first fit had occurred within three months of injury or after the fourth year.

6. The epilepsy seemed to have died out in 19 per cent. of cases followed for more than five years after the first fit, usually after persisting for less than two years. Fits commencing in the first three months or after the fourth year proved less likely to go into remission.

It would seem advisable to prescribe anti-convulsant drugs prophylactically after injuries complicated by an early fit, or by intracranial haematoma, or by a depressed fracture if this is associated with more than 24 hours' P.T.A. or with dural penetration. These drugs should certainly be continued for a year after injury; if the risk of epilepsy is deemed high, this period might be extended.

If any overall conclusion emerges from these studies it is that the risk of late epilepsy varies enormously with the nature of the injury and the early complications. Such accuracy in prognosis as it is possible to achieve must rest therefore on observations made and recorded during the acute illness. The high standard of documentation of head injuries insisted on by Sir Hugh Cairns in the Army during the last war has already yielded its fruits in those many studies based on service cases. The emulation of this standard by Mr. Walpole Lewin in the Accident Service in Oxford is what alone made possible the assessment of the incidence of early and late epilepsy which is the basis of this investigation. It is a pity that in conditions of peace there should be so few casualty departments in this country making a serious attempt to attain such a standard of recording.

I should like to end on this note of recall of my first neurosurgical mentor, Hugh Cairns, whose untimely death is already almost a decade away. His influence, particularly on traumatic neurosurgery, will continue through the work and writings of his many disciples. I feel fortunate to count myself among their lower ranks, and in humility hope to serve his memory well.

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CENTENARY MEMORIALS

THIS YEAR MARKS a centenary anniversary of two outstanding figures in medical history and small displays illustrating their work have been placed in the Exhibition Hall. The subjects are John Thomas Quekett (1815–1851), famous microscopist and third Conservator of the Hunterian Museum; and Fridtjof Nansen (1861–1930), well known as an explorer and philanthropist, but also distinguished as a neuro-anatomist. His investigations in this field were carried out while he was Curator of the Bergen Museum and the results were published between the years 1885 and 1895. He was the first to describe the fact that each dorsal root fibre, on entering the spinal cord, bifurcates into ascending and descending branches ("Nansen's fibres"). This outstanding discovery provided the anatomical basis for Sir Charles Sherrington's studies of intersegmental spinal reflexes. Nansen was also the first to describe the mixture of bipolar and unipolar neurones that is characteristic of the dorsal root ganglia of fishes ("Nansen's cells"). This paper was published in 1895 when he himself was in the "Fram" drifting in pack-ice through the Arctic Ocean in latitudes farther north than anyone before had reached. A more detailed account of Nansen's work, by Dr. Wyke, will appear in a future issue of the *Annals*.

THE EPITOME OF VESALIUS

Another notable acquisition for the Library
described by

Geoffrey Keynes, Kt., M.D., D.Litt., F.R.C.P., F.R.C.S., F.R.C.O.G.
Honorary Librarian of the College

TWO YEARS AGO, in vol. 25 of the *Annals* of the College we were able to describe a newly acquired copy of the very rare English version of the *Compendiosa delineatio* of Thomas Geminus, 1553, a piracy of the *Epitome*



Fig. 1.

of Vesalius, 1543. This had been acquired by private purchase and formed an important addition to the series of Vesalian textbooks in the Library of the College. Recently the College has bought at Sotheby's auction rooms another related volume of somewhat lesser importance, but nevertheless of great interest. This is a later imitation of the Geminus dated 1600 on the title page and 1601 in the colophon. It was printed and published in Cologne and has an *Epistola Dedicatoria* addressed to the *Consules ac Senatores* of the City signed by *Henricus Botterus*, dean *pro tempore* of the Medical Faculty of the University. The book, a large folio, contains

the full Latin text of the *Epitome* preceded by a six-line Latin verse in praise of Vesalius. The 40 engraved plates, copied from those in the Geminus of 1545, had already been used in Jacob Bauman's *Anatomia Deudsch*, Nürnberg, 1557, a German version of the *Epitome*. For this reason the legends on the plates are in German, although the text is in Latin. Having been used before, the plates have given somewhat weak impressions in the edition of Botter, but they include the large "Adam and Eve" plate missing from the College copy of the English Geminus. Botter has, however, added a newly engraved copy (Fig. 1) of the woodcut portrait of Vesalius in the *Fabrica* of 1543, and this is one of the earliest reproductions of the only authentic likeness of the great anatomist. The engraved title-page (reproduced here, Fig. 2) is an enlarged and somewhat altered version of the title-page of Valverde's *Anatomia del corpo humano*, Rome, 1560, which also contains copper-plate versions of the Vesalian wood-cuts.

The book is an unsophisticated copy bound in contemporary vellum, and except for some unimportant water stains on a few leaves is in excellent condition. Former owners have left their inscriptions on both sides of the title-page. One, writing below the engraving, proudly announces himself as: *Paulus Olaides possessor legitimus*, with the date 2/4 1652. Below his signature he has added:

*O, cur, mors, Deus negat vitam
superbe bis, te, nus, bis, nam. Ergò,
Cum sis humi limus, esto humillimus.*

[Mr. Le Fanu interprets the cryptogram (line 2) as "superbe te tenuis supernam", meaning:

O why, death, does God proudly
deny you life above. Therefore,
Since you are earth to earth, be very humble.]

Alongside the first signature is another: *Jacobus Pauli Postius*. On the back of the title-page the first Paulus has written a well-known Latin tag concerning the humours of the body:

*Vitalia hominis membra.
Corde homines sapiunt, est à pulmone loquela.
Splen risum, iram fel concitat, hepar amat.
Paulus Olaides P.S.*

[Man's vital members.
Men reason in the heart; speech is the lung's.
The spleen stirs laughter, the gall wrath, the liver loves.]

Another version of the lines is written below in a different hand:

*Cor sapit et pulmo loquitur, fel commovet iras,
Splen ridere facit, cogit amare jecur.
Gladder Gladder!*

[Heart reasons, lung speaks, gall moves to wrath,
Spleen causes laughter, liver wakens love.]

THE EPITOME OF VESALIUS

The meaning of the last two words, written in yet another hand, is obscure.

This edition of the *Epitome* was doubtless used up in the dissecting rooms of the German medical schools and is now very uncommon. There are two copies in the Cologne City Library; others are to be found in the National Medical Library, Washington, D.C.; Michigan University (Crummer Collection); Upsala University Library (Waller Collection);



Fig. 2.

Yale Medical Library (Fulton Collection). Harvey Cushing had a copy (now also at Yale) in which the dedication is signed *Decanus facultatis Medicae* without Botter's name. There is a copy in the Wellcome Historical Medical Library.

The collation of the book given in Cushing's *Bio-bibliography of Vesalius* is not quite correct. The fact that this copy is in its original binding has made it possible to establish the actual constitution of the volume as given below.

Bibliographical description

VESALIUS: EPITOME edited by Henry Botter. Cologne. 1600-1601.

Engraved title: ANDREÆ / VESALII / BRUXELLENSIS / Suorum de Humani corporis / fabrica librorum Epitome: / Cum Iconibus elegantissimis iuxta Germanā / Authoris delineationem artificiosè iam=/ pridem ex ære expressis: additis unicuiq. / notis et indicibus alphabeticis, quibus phi=/ losophiæ ac Medicinæ Studiosi ad facilem / et absolutam anatomes cogni=/ tionem tanquā manu / ducantur. / Opus perinsigne, nunc primum in Germa=/ nia renatum, hacq. forma quam / emendatissimè editum. / Anno / 1600.

Imprint at the bottom of the engraving: COLONIE VBIORV FORMIS ET EXPENSIS IOAN. BUXMACHERI ET GEORGII MEYTINGI.

Colophon: COLONIAE AGRIPPINAE, / Typis Stephani Hemmerden. / ANNO M. DCI.

Collation: f°. *⁴, A-G⁶, H⁴; 50 leaves without pagination; 40 plates of which 38 are inserted through the text, lettered A-Z, a-r. Size of page 380 × 245 mm.

Contents: *1a engraved title, verso blank; *2a-3b *Epistola Dedicatoria* signed Henricut Botterus, D. ac facultatis / Medicæ pro tempore Decanus. *4a *In commendationem huius operis ad studiosos Hexastichon*; *4b engraved portrait of Vesalius; A1a-B5b text of *Epitome*; B6 plates B and C on recto and verso; C1a-H4b remainder of text. 38 plates inserted.

Note: As in a copy mentioned by Cushing (*A Bio-bibliography of Vesalius*, 1943, VI.D.-10, p. 135) the editor's first name is misprinted *Henricut*, and this has been corrected by pen. According to the collation given by Cushing section B contains five leaves, but this is incorrect. Close examination of our copy shows that the leaves B1 and B2 are conjugate; B3 is conjugate with a leaf carrying the two plates lettered B and C and B4 is conjugate with B5. Clearly the leaf with the plates is B6, though the binder of our copy has sewn the three pairs of leaves separately, so that B6 comes between B3 and B4. These two plates, therefore, on one leaf are not insertions, but are part of the book. The other 38 plates, all printed on one side of the leaves only, are insertions and are mostly on thinner paper than the rest of the book.

**McNEILL LOVE MEDAL:
RECOGNITION OF LONG SERVICE IN THE COLLEGE**

DURING THE COURSE of last year the Council was giving thought to the foundation of a scheme whereby it could give formal recognition of long service on the Staff, and the following proposals were adopted on 13th April 1961:

“ That long service on the staff be recognized as follows:

After 15 years' service: The name to be reported to the Council and a congratulatory document to be given in duplicate—one copy for the member of staff and one for the notice-board.



The McNeill Love Medal

After 25 years' service: Further report to the Council, similar issue of congratulatory documents. A notice to be put in the *Annals* with a brief résumé of the service given.

After 40 years' service: The member of staff to be introduced at a Council meeting for personal congratulation and award of a McNeill Love Medal. Issue of congratulatory certificates. Names to be inscribed on a board posted in the College."

It was also decided that a bonus might be awarded in appropriate cases after each period of service. The McNeill Love Medal mentioned as the award for 40 years' service has been made possible by the Council devoting part of a generous benefaction by Mr. R. J. McNeill Love, F.R.C.S., to this purpose. The medal is of bronze and bears on one side the College Arms and on the other an inscription, as is shown in the accompanying illustration (Fig. 1).

MCNEILL LOVE MEDAL

Three members of the Staff were already eligible for recognition of 40 years' service, Mr. Samuel Wood having joined the staff in 1901, Mr. Sidney Percy Steward in 1912, and Mr. Joseph Charles Higgins in 1917. At a ceremony at the Council Meeting on 12th October 1961, each of these received a congratulatory address and a McNeill Love Medal (Fig. 2). Résumés of the record of service of each recipient are given below.

Further members of the staff have completed 25 years' service and 10 have completed 15 years' service. It is hoped to arrange for the appropriate recognition by the Council in the near future.



Mr. S. Wood receiving the McNeill Love Medal from his sponsor, Mr. W. R. Le Fanu. Left to right: Dr. L. W. Proger (Pathology), the President, Professor D. Slome (Physiology), Mr. W. R. Le Fanu (Librarian), Mr. S. Wood, Sir Eric Riches (Vice-President), Mr. S. P. Steward and Mr. J. C. Higgins.

"Samuel Wood began working in the College in August 1901, as Junior College Messenger, shortly before his 14th birthday. He became Library Attendant in 1904 and was appointed Assistant in the Library in 1931. Since 1939 he has been in charge of the Reading Room. His receptiveness for information has kept him fully alert to modern advances, while his infallible memory and complete familiarity with the library's resources put his store of knowledge at the service of all enquirers, not least his colleagues in the library. If the saying be true that a librarian's first task is to save other people's time, Mr. Wood has earned his reputation as a good librarian a thousandfold, and proved himself indispensable to several generations of our scientific and Museum workers, for whom also he has compiled extensive bibliographies and indexes. He has contributed historical chapters to books by Fellows of the College, and has himself written articles of permanent value in several journals including the *Annals of Medical History* and our own *Annals*. Mr. Wood is lucky enough to seem young at 74: constant reading has not dimmed his sight and his hand is still strong to adjust an awkward shelf and neat to repair a damaged book. Aided by his clear memory for names and faces, his quiet friendliness has remained unruffled while he has watched the College staff and students, who frequent the Library, grow from a mere handful to a great company."

MCNEILL LOVE MEDAL

"Mr. Sidney Percy Steward joined the College staff in January 1912, as assistant to Mr. R. H. Burne. After serving with the R.A.M.C. from June 1915 to February 1919 he returned to College and assisted in the maintenance of the Physiological Series of the museum. From 1927 he was technical assistant to Sir Charles Ballance in his experimental investigations of the regeneration of peripheral nerves. Later Steward became the senior technician of the Bernhard Baron Research Laboratories of the College. His work embraced all varieties of laboratory technology including workshop practice, photography and the development of new electronic equipment.

"On 3rd September 1939 he again joined the R.A.M.C. as one of the original members of the Army Blood Transfusion Service and served in France until June 1940. Since the end of the war he has assisted in the research projects of the Department of Physiology and has been in charge of the mechanical and electronic workshop."

"Joseph Charles Higgins entered the service of the College in February 1917, just under the age of 14, and spent his first three years in the Hall as a Messenger. In accordance with the normal practice at that period, he was promoted in due time to the Museum. In his case this meant a post in the Pathological Workroom when Sir Arthur Keith was Conservator and S. G. Shattock was Pathological Curator. Under the tuition of Sidney Bithell he soon developed a very useful pair of hands.

"Increasing seniority brought him to the position of Museum Foreman, a post which he held throughout the years of the Second World War. At this time his services to the College were quite outstanding. Though unfit for military service, he was one of the few able-bodied men able to remain at work in the College, and proved himself invaluable in such matters as general maintenance, A.R.P., first-aid repair of the buildings, and, very particularly, care of the Museum specimens. These latter were dispersed to various centres during the latter years of the war, and all in turn were subject to periodical visits by Higgins in his maintenance van.

"After the war the greatly increased lecture programme gave Higgins a correspondingly increased opportunity to prove his value as a projectionist. This he has taken to the full, not only in the smoothly efficient technique of his work, but also in his interest in the job and the great help he habitually gives to the many lecturers in the College."

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Orders should be sent to University Microfilms Limited, 44 Great Queen Street, London, W.C.2.

In Memoriam

**LAMBERT CHARLES ROGERS, C.B.E., V.R.D., M.Sc.,
M.D., M.Ch., F.R.C.S., F.R.C.S.Ed., F.R.A.C.S., F.A.C.S.
(1897-1961)**

THE NEWS OF the sudden death of Lambert Rogers must have brought sadness to countless friends all over the world. Perhaps it was his courteousness, his kindliness, and his integrity that had endeared him to so many in every walk of life, but there were other intangible qualities too.



Professor Lambert Rogers

He was shortly to retire from the Chair of Surgery in the University of Wales which he had held with great distinction since 1935.

It was in June of 1929 that he was appointed first senior assistant, and the writer a junior assistant under Professor A. W. Sheen. Then began a greatly valued friendship. It was at this time that one realized how meticulous and painstaking a surgeon he was. Nothing was too much trouble where the interest of his patients was concerned. Throughout his life he sought exact knowledge, and was never willing to accept the traditional view unless it could be amply verified, and better still proved by his own observations or research. This was true in both anatomy and surgery, and led to important contributions in several fields of work.

IN MEMORIAM

In the early days he was quite a pioneer in goitre surgery, and that was before this kind of surgery had been largely robbed of its terrors. I suppose his meticulous technical ability was best shown in his work in neuro-surgery, particularly in that of the spinal cord and the spinal column. He leaves behind a unique collection of spinal cord tumours which must surely be a proud possession of the Welsh National School of Medicine.

Many papers were written and books both rewritten and edited. He had an extraordinary memory for an apt quotation—he seldom wrote a paper or gave a lecture without beginning with such.

Mention must be made of his service in the Navy in both wars. Quite proud to have been a Surgeon Probationer in the first, he served with distinction as a Surgeon Captain in the second. For the greater part of his life he remained a bachelor, and in earlier days we used to tease him about his "home" in Lincoln's Inn Fields. Indeed, he served our College well and truly, from 1943 to 1959 as a Councillor and from 1953 to 1955, as Vice-President. Apart from accepting his full period as examiner in the Final Fellowship, he was for many years examiner in anatomy in the Primary Examination. The honours which were bestowed upon him in the way of statutory lectures and honorary degrees make impressive reading. Always a keen supporter of the International Society of Surgery, he was British Delegate from 1947, and had recently been made a Vice-President. He was sometime President of the Association of Surgeons of Great Britain and Ireland, President of the Society of British Neurological Surgeons, President of the Moynihan Chirurgical Club, Secretary from 1940 to 1950, President of Section of Surgery, Royal Society of Medicine and British Medical Association, President of Cardiff Medical Society and of the Welsh Surgical Society—the latter from 1953 to 1958. He was Vice-President of the Cardiff Business Club and very many members of that Club came to Llanishen Church on 14th October. Withal, he remained a humble man, with a simple way of life based on strong Christian convictions—which he practised more than preached.

At last, in 1952, he made a truly happy home in Cardiff when he married Barbara Ainsley, by whom he had one greatly loved daughter. It is to them, and to his stepson, that our continuing sympathy is extended.

Everyone will know of his Australian upbringing and how he loved to go back there from time to time, and how delighted he was when the University of Melbourne conferred upon him the degree of M.D. (*honoris causa*) in 1952.

Although he had many staunch and close friends, perhaps the two most notable were George Grey Turner and Gordon Gordon-Taylor, both great sources of strength and inspiration to Lambert, as indeed they have been to many others.

It would be hard to estimate the debt that is owed to this one man by the Welsh National School of Medicine and Welsh surgery generally. He did

IN MEMORIAM

so much "to bring together the surgeons of Wales both from the teaching school and from the periphery, helping to solve their problems and refresh their enthusiasms".

It has been said that "the primary requirement for a career in surgery is physical stamina". Lambert Charles Rogers attained high eminence in spite of set-backs in health because of a "singular tenacity of mind and immense courage, as well as the highest qualities of intellect". As a well known surgeon of the country of his adoption wrote: "We shall always treasure the friendship of this fine and unusual Australian, this 'very parfait gentle knight'".

R. V. C.

PROFESSOR RAFFAELE BASTIANELLI, Hon. F.R.C.S. (1863-1961)

BY THE DEATH of Professor Raffaele Bastianelli on 1st September 1961, world surgery has lost its doyen. It is wonderful to reflect that Bastianelli's fame as a surgeon was already established before the close of the 19th century. He retained great activity of mind and body even in the last decade of his long life of nearly 98 years and he was certainly still operating from time to time at the age of 88.

Raffaele Bastianelli was born on 26th December 1863, of a medical family. He qualified at Rome in 1887. In 1902 he was appointed professor of clinical surgery in Rome. In 1913 he was made an honorary Fellow of the Royal College of Surgeons of England, and in 1928 an honorary Fellow of the Royal Society of Medicine. At the time of his death he was the senior Foreign Corresponding Member of the British Medical Association, having been appointed in 1935.

In World War I, Bastianelli was in charge of a forward surgical unit, and in 1918 he was selected to be the Italian member of an Allied surgical mission to the U.S.A. The French members were Pierre Duval, Henri Beclere (the radiologist) and Adrien Piollet, and the British Army sent Colonel Sir Thomas Myles, Colonel George E. Gask and Major George Grey Turner (who, according to one American newspaper, had "won the name of the most brilliant British field surgeon the war has produced"). My father compiled a fascinating scrapbook of this visit to America in wartime. The mission was received by President Wilson at the White House, and toured the country lecturing to groups of military medical officers. After their visit to St. Paul, the Press reported: "That it was the most brilliant array of medical talent ever brought together at one time before St. Paul and Minneapolis medical men was the consensus of opinion among the audience following the lectures which occupied three hours of almost breathless interest."

IN MEMORIAM

At the School of Military Surgery at Camp Greenleaf in Georgia there was an all-day scientific meeting at which the programme was substantially as follows:

Song by students: " Good morning Mr. Zip, Zip, Zip ".

" Early treatment of gunshot wounds of the chest " (Gask).

Song.

" Treatment of later stages of gunshot wounds of the chest " (Grey Turner).

Song.

" Artificial pneumothorax and the treatment of chest wounds " (Bastianelli).

Song.

" Gunshot wounds of the femur " (Myles).

Song.*

" General principles of war wounds with lantern slides " (Beclere).



Professor Raffaele Bastianelli, Hon. F.R.C.S.

The programme issued by the Director of the School continued as follows:

" It is further suggested that the guests be provided with horses for the good of their health and perchance the enjoyment of the Camp.

" That on Saturday evening an informal dinner be given in one of the large mess halls at which time the American Eagle and the British Lion may mingle their scream and roar with the perfume of the Lilies of France."

The Press reported that " Professor Bastianelli, of the University of Rome, told of the use of a rubber balloon as a stoppage to the chest cavity after a major operation ".

The visit of the Allied surgeons ended with a farewell dinner on 6th November 1918, given (at Delmonicos, New York City) by the New York Fellows of the American College of Surgeons. The list of those

* My father wrote afterwards: " The Americans make much more serious use of music in their army than we do. It comes under the department of ' morale ', and there are regular ' song leaders '. We all found the interludes of song refreshing, and the morning must have been long and dry without the music."

IN MEMORIAM

present includes Colonel William J. Mayo, Dr. W. B. Coley, and Colonel Franklin Martin. On this occasion the Honorary Fellowship of the American College was conferred upon Bastianelli and the other visiting surgeons.

On 9th November 1918, the *New York Medical Journal* devoted a leading article to the visit of the Allied surgical mission and referred to the revolution in surgery which had been effected during the war. "The essential feature of this revolution is a recognition of the fact that all war wounds are infected wounds, that to prevent further infection it is essential that all dead tissue be completely removed, and that prompt attention is of primary importance. . . . We are indeed fortunate in having with us these masters of surgery, the men who have created a new war surgery and have thus done so much to salvage the human wreckage of war."

On 10th November 1918, Sir Thomas Myles and my father left New York in the *Mauretania*. Next day the following signal was received by the ship at sea: "Washington to All Ships. Armistice signed at 5 a.m. G.M.T. 11th November 1918. Hostilities cease at 11 a.m. G.M.T."

Bastianelli and my father became firm friends on this visit to America and remained so until parted by my father's death 33 years later. They corresponded freely, and whenever my father visited Rome he called upon his friend and former colleague.

My first meeting with Bastianelli was in 1944. Not long after the capture of Rome, I was sent on a short leave to Rome with another officer of my battalion, and I made a point of calling at Via dei Villini 2 in order to pay my respects to my father's old friend. My diary records the meeting:

Thurs., 20th July, 1944

. . . then called on Professor Bastianelli at 2 Via dei Villini. He and Madame (who is an American) were delighted to see us, and spoke a great deal about old times and about the present ruined condition of Italy.

Sun., 23rd July, 1944

. . . tea with the Margottinis, at which poor old Senator Bastianelli appeared. I am sure he has been very much broken by the disasters which have overtaken his country.

Bastianelli was very tall and had a spare, wiry figure. He wore an imperial, but the most striking feature of his appearance was his brilliant eyes. He spoke English fluently, and his conversation was that of a man of lofty intellect and of the widest interests and culture.

In 1951, my parents had been invited to go on from the XIVth Congress of the International Society of Surgery in Paris to stay with the Bastianellis at their country villa near Siena, but unhappily my father died with great suddenness a month beforehand. With true kindness and sympathy, the Bastianellis insisted that the visit should still take place, and I accompanied my mother to Italy. My diary relates:

IN MEMORIAM

Toiano, Sovicille, nr. Siena

Sat., 29th Sept., 1951

Arrived at Florence at 7 p.m. Bastianelli greeted us with great warmth and charm. Drove through the bright lights and busy streets of Florence . . . Long drive down here, charming welcome from Signora Bastianelli.

This is a lovely quiet Italian country house . . . What a brilliant intellect is Bastianelli's, even at the age of 88.

Sun., 30th Sept., 1951

. . . the Professor took us to see some of his tenants' farms. They are all well fitted out, and the tenants are all very amiable, but Bastianelli says they are strong Communists!

Mon., 1st October, 1951

At dinner the Professor related some of his astounding experiences as an aviator, mountaineer and hypnotist. What a wonderful man! He has amazing memories of Rome in 1870, of all the great figures of recent Italian history, especially of the late King and Mussolini. He also shook hands with Hitler in Rome—Hitler was struck by his eyes and shook him warmly by the hand.

Turin

Tues., 2nd October, 1951

. . . Then the Bastianellis took some photographs of us. At noon we had lunch, and after saying farewell to Lucile (Signora B) and the servants we drove off with the Professor to Florence. Glorious views on all sides, what a sun-kissed smiling countryside! . . . Very warm farewell from the old Professor, who has been a charming host.

And now this charming host and world-famous surgeon has passed on, and the sun-kissed smiling countryside is a poorer place.

E. G. T.

VISCOUNT CROOKSHANK, P.C., C.H., M.A. (1893–1961)



Lord Crookshank

CAPTAIN HARRY CROOKSHANK (as he then was) had already made it clear that he was a friend of the College some years before he became Minister of Health. He and his sister had paid many friendly visits, and she has left in the College a very pleasing memento in the form of a fire screen worked by herself with the design of the Arms of the College.

As Minister of Health, Captain Crookshank was naturally welcomed more formally to the College on its most important occasions, and it is good to think that in this way the connection developed and the friendship ripened. It seemed natural, perhaps even obvious, to invite him in 1956,

IN MEMORIAM

by that time Viscount Crookshank and freed from the cares of parliamentary office, to fill a vacancy on the Board of Trustees of the Hunterian Collection. From his first meeting onwards he showed great interest in the Museum and keenness for the work of the Trustees, and he was both a friendly and a stimulating member of the Board.

Lord Crookshank was also a member of the College Committee on Artistic and Historical Possession, and took as his special care the College collection of silver. This was not a nominal affair, for he paid periodical visits to the plate store and took a real interest in the treasures stored there.

Such was the service to this College of a true gentleman who served his country so nobly in a wider sphere.

K. C.

BERNARD DARWIN AND DOWNE

THE RECENT DEATH of Bernard Darwin recalls the following letter which he wrote to the President of the College after the ceremony of laying the foundation stone of the Buckston Browne Farm:

Gorringes, Downe, Kent.

July 9, 1931.

Dear Lord Moynihan,

I am putting down in writing, as you asked me to, what I said to you to-day at Downe.

In your Annual Report it is stated that the field in which your new building will stand is to be called the Orchard Field.

I venture to think this is rather a pity, because the field has a good old name of its own, by which it has always been called. It is Little Pucklands and the field next door, beside the Sandwalk, is Pucklands. It is a rather engaging fact that the proper local pronunciation is Pooklands, thus confirming Kipling in *Puck of Pook's Hill*.

May I add how much my wife and I enjoyed our afternoon and appreciated the invitation to be present?

Yours sincerely,
(Signed) BERNARD DARWIN.

It is gratifying now to realize that Mr. Darwin's wishes were respected. The field on which the farm stands has never been known by the College as "Orchard Field", and the name of the technician's bungalow, which stands on a part of it, was changed from "High Hedges" to "Little Pucklands" as soon as the College got possession.

K. C.

FACULTY OF DENTAL SURGERY

AT ITS LAST meeting, the Council of the College, acting upon the recommendation of the Board of Faculty of Dental Surgery and the Board of Examiners for the Licence in Dental Surgery, awarded the Evelyn Sprawson Prize to John Llewellyn Williams of Guy's Hospital.

THOMAS VICARY COMMEMORATION

THE THOMAS VICARY COMMEMORATION was held on 26th October 1961, when Sir Clement Price Thomas delivered the Thomas Vicary Lecture on "Vicary amongst his contemporaries". Prominent in the audience were the Master, Wardens and Court of Assistants of the Worshipful Company of Barber-Surgeons, the donors of the lecture.

It was the turn of this College to be the host at the dinner, and the Council duly entertained the Court of the Company in the Council Room the same evening. The President (Sir Arthur Porritt) was in the Chair and welcomed the guests, speaking of common interests which had existed for 800 years and the recent friendship between the two bodies which had been brought about by the initiation of the Thomas Vicary Lecture by the Barbers in 1919. He spoke of the College's activities in research, in applied science, and in its surgical connections with the British Commonwealth.

The Master (Mr. Kenneth Cross), in his speech of thanks, described the Thomas Vicary Commemoration as a red-letter day in the Barber-Surgeons' Calendar. He too spoke of the long association between the two bodies, and told something of the history of the Grace Cup which had twice been stolen in its early years and on one of the occasions of its return had been brought back by Edward Arris, part founder of the Arris and Gale Lectures.

Mr. Henry Thompson, F.R.C.S., past Master of the Company, proposed the health of the Thomas Vicary Lecturer in a notable speech, giving an entertaining résumé of Sir Clement's remarkable career, in the course of which the saga of the army mule was inevitably retold. He paid tribute to the advances in chest surgery brought about by Sir Clement, and hailed him as a most suitable Adviser in Surgical Training in the College.

Sir Clement Price Thomas thanked Mr. Thompson and all present, and replied in a light-hearted manner befitting the occasion.

PROCEEDINGS OF THE COUNCIL IN NOVEMBER

AN ORDINARY MEETING of the Council was held on 9th November 1961, with Sir Arthur Porritt, President, in the Chair.

The Council recorded with deep regret the death of Viscount Crookshank, who for many years had been a Trustee of the Hunterian Collection.

The Hallett Prize was awarded to Paul Vincent Mills of the London Hospital Medical College for his success at the recent Primary Examination for the Fellowship.

PROCEEDINGS OF THE COUNCIL IN NOVEMBER

Diplomas of Membership were granted to 138 candidates.

Licences in Dental Surgery were granted to 99 candidates.

The following hospitals were recognized under paragraph 23 of the Fellowship regulations:

HOSPITALS	POSTS RECOGNIZED		
	General Surgery (6 months unless otherwise stated)	Casualty (all 6 months)	Unspecified (all 6 months)
*FARNBOROUGH, County Hospital and Bromley Group			Orth. Regr.
AYR, County Hospital	Regr.		
*GLASGOW, Western District Hospital	2 H.Os.		
STORNOWAY, Lewis Hospital		Surg. Regr. (Cas.)	
BROXBURN, Bangour Hospital	2 Surg. Regrs.		
*LONDON, Whipps Cross Hospital		Confirmation of temporary recogni- tion Cas. Offr. (Regr.)	
*LONDON, St. Stephen's Hospital		2nd Cas. Offr.	
NEW DELHI, Sir Ganga Ram Hospital	Renewal for 3 years from Feb. 1962 2 H.Os.		
VALE OF LEVEN Hospital, Alexandria	S.H.O. Junior H.O.		

*Other posts have previously been recognized at these hospitals.

The Council agreed, at the request of the United Arab Republic, to hold a Primary F.R.C.S. Examination in Cairo in March 1962.

After the meeting the Bradshaw Lecture was delivered by Professor Digby Chamberlain on "The spleen and its removal."

DONATIONS

DURING THE LAST few weeks the following generous donations have been received :

Appeal Fund—Donations:

£2,500	Alliance Building Society
£150	Anonymous
£105	Colgate-Palmolive, Ltd. (further gift)
£100	Mrs. M. Phipps
£52 10s. 0d.	A. L. Stevens, Esq.
	The Stanley Foundation, Ltd.
£31 10s. 0d.	Mr. & Mrs. C. H. Fuller
£30	T.W.W., Ltd.
£26 5s. 0d.	The Association of Clinical Pathologists
£25	Mr. and Mrs. F. D. Sharples (further gift)
£5	H. E. Boyd, Esq.
10s. 0d.	H. C. Beaumont, Esq. (further gift)
5s. 0d.	Miss Rose Thompson

DONATIONS

Department of Anaesthetics—Covenant:

£50 Os. 0d. p.a. for 7 years less tax

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Voluntary subscriptions and donations by Fellows:

The following Fellow and Fellow in Dental Surgery have generously given a donation or undertaken to make a voluntary annual subscription under covenant:

H. S. Malcolm Crabb, F.D.S.R.C.S.

J. A. Pocock, F.R.C.S.

DIARY FOR DECEMBER

Wed.	20	5.00	Board of Faculty of Anaesthetists.
Sat.	23		College closed.
Mon.	25		College closed.
Tues.	26		College closed.
Wed.	27		College closed.

DIARY FOR JANUARY

Mon.	1		Last day for nomination of candidates for election to the Board of Faculty of Anaesthetists.
Tues.	2		Final Membership Examination begins.
Wed.	3		D.I.H. Examination begins.
Thurs.	4	5.00	MR. D. ANNIS—Arris and Gale Lecture—The study of the regenerative capacity of the epithelial lining of the urinary bladder, together with evidence concerning the function of the mucosa in the reflex action of micturition.
Mon.	8		Final F.D.S. Examination begins.
Tues.	9	4.15	PROFESSOR G. CAUSEY—Arnott Demonstration—Recent advances in investigation of renal stricture.
Wed.	10	5.00	DR. 'O.' H. WANGANSTEEN—Moynihan Lecture—The stomach since the Hunters: gastric temperature and peptic ulcer.
Thurs.	11	2.00 5.00	Quarterly Council. MR. F. W. HOLDSWORTH—Watson-Jones Lecture—Fractures and fracture dislocations of the spine.
Tues.	16		Final F.F.A. Examination begins.
Wed.	17	5.00	DR. J. KOHN—Erasmus Wilson Demonstration—
Fri.	19	5.00	Board of Faculty of Dental Surgery.
Mon.	22		Voting papers for election of Fellows to the Board of Faculty of Anaesthetists issued.
Wed.	24	5.00	MR. C. Q. HENRIQUES—Arnott Demonstration—
Mon.	29		Final L.D.S. Examination (Part I) and D.O. Examination begin.
Tues.	30	5.00	MR. ARTHUR NAYLOR—Arris and Gale Lecture—The bio-physical and chemical basis of intervertebral disc herniation and degeneration.



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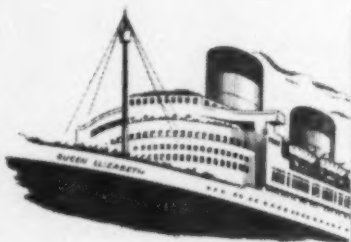
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2. Haematinic Factors. Of all the factors required for blood formation, only three are likely to be limited in the diet - iron, vitamin B₁₂ and folic acid. One cup of Bovril will supply 35% of the adult's daily

requirement of vitamin B₁₂ (cyanocobalamin) and 20% of the folic acid.

3. Gastric Secretion. The unique mixture that is Bovril is the most powerful known stimulant of gastric secretion - even more powerful than meat extract itself. It is, therefore, particularly useful for elderly patients and convalescents.

4. Appetite. A major factor in the rapid recovery from serious illness or major surgery is a good intake of protein foods. Poor appetite can delay recovery. Bovril is a great help in promoting good appetite while stimulating gastric secretion.

Every ounce of Bovril contains: 1.02 mg riboflavin, 6.8 mg niacin, 1.1 µg vitamin B₁₂, 68 µg folic acid.

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